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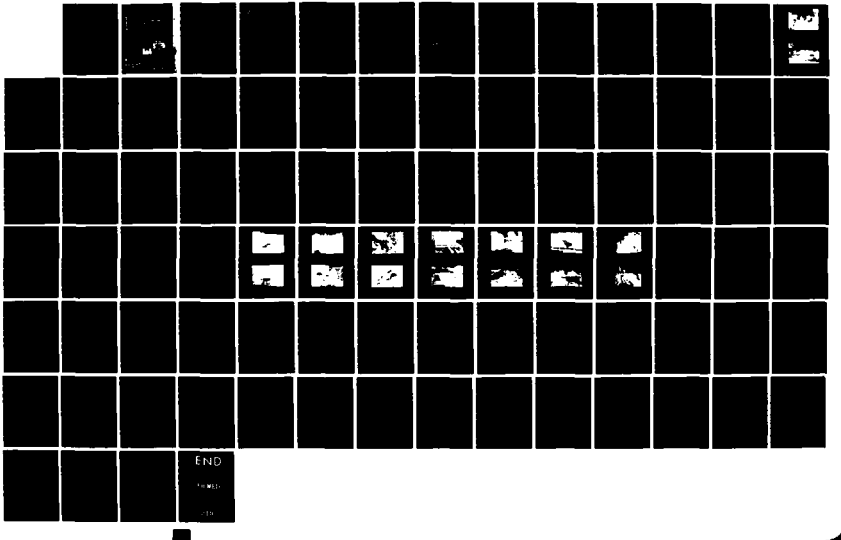

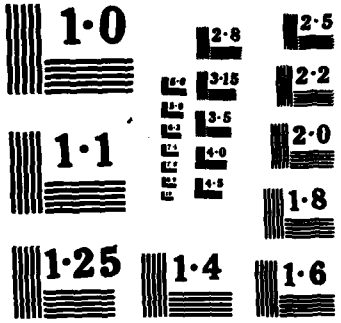
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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

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JANUARY 1980

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,

Taunton River Basin
Brockton, Massachusetts
Beaver Brook

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

THe dam is a gravel and clay fill embankment about 340 feet long with a maximum height of about 11 feet and a top width averaging 80 feet. The dam appears to be in fair condition. The upstream slope and crest are well maintained. It has a classification of small in size and a significant hazard potential. The owner should retain the services of a registered professional engineer for various purposes.

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

REPLY TO
ATTENTION OF:
NEDED

MAY 30 1980

Honorable Edward J. King
Governor of the Commonwealth of
Massachusetts
State House
Boston, Massachusetts 02133

Dear Governor King:

Inclosed is a copy of the Upper Porter Pond Dam Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Quality Engineering, the cooperating agency for the Commonwealth of Massachusetts. In addition, a copy of the report has also been furnished the owner, the city of Brockton.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Quality Engineering for your cooperation in carrying out this program.

Sincerely,

MAX B. SCHEIDER
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

UPPER PORTER POND DAM

MA 00425

TAUNTON RIVER BASIN

BROCKTON, MASSACHUSETTS

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM

PHASE I INSPECTION REPORT

Identification No.:	MA 00425
Name of Dam:	Upper Porter Pond Dam
Town:	Brockton
County and State:	Plymouth, Massachusetts
Stream:	Beaver Brook
Date of Inspection:	October 17, 1979

BRIEF ASSESSMENT

Upper Porter Pond Dam is a gravel and clay fill embankment approximately 340 feet long with a maximum height of about 11 feet and a top width averaging 80 feet. The upstream slope on either side of the terraced spillway is about 3H:1V and the downstream slope is approximately 2H:1V. The broad crested stone masonry terraced spillway is located approximately 200 feet left of the right abutment of the dam. This structure was built in 1940 as part of the City of Brockton's park development program.

The dam appears to be in fair condition. The upstream slope and crest are well maintained. The lower portion of the downstream slope appears to be structurally sound; however, small trees and brush on the upper portion of the slope increase the potential for seepage and introduce the possibility of embankment damage should the trees be uprooted. Several areas along the upper portion of the downstream slope show evidence of surface erosion.

Upper Porter Pond Dam has a maximum storage capacity of approximately 79 acre-feet and a maximum height of about 11 feet. Therefore, the dam is classified in the "Small" size category. Approximately 35 inhabitable structures are located downstream of Thirty Acre Pond, which is located immediately downstream of Lower Porter Pond, which is immediately downstream of Upper Porter Pond. A densely populated urban neighborhood is located downstream of the 35-home community. A failure of Upper Porter Pond Dam could cause appreciable property damage but little or no loss of life in the downstream communities. Therefore, the dam is classified in the "Significant" hazard category. The recommended test flood range for a "Small" size, "Significant" hazard dam is from the 100-year flood to one-half of the Probable Maximum Flood (PMF). The selected test flood for this structure is one-half of the PMF.

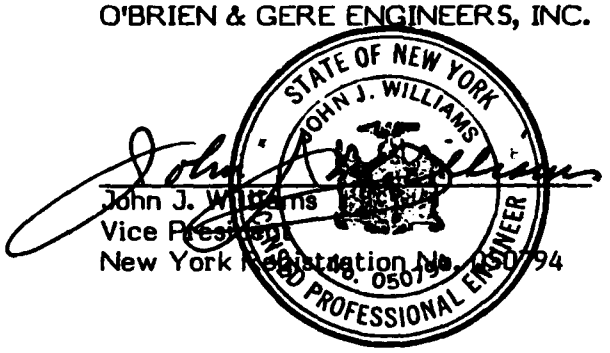
The test flood peak inflow to Upper Porter Pond was computed as 2,500 cfs. The routed test flood outflow of 2,475 cfs overtops the embankment by 1.4 feet.

The spillway is capable of discharging 508 cfs prior to overtopping of the embankment, which is about 21 percent of the routed test flood outflow.

Within one year after receipt of this Phase I inspection report, the Owner should retain the services of a registered professional engineer, experienced in the design and construction of dams, for the following purposes: (1) perform a detailed hydrologic and hydraulic study to assess the need for increasing the project discharge capacity; (2) study the possiblity of Waldo Lake (upstream of Upper Porter Pond) overflowing the area along the D. W. Field East Parkway and evaluate the consequences of such an occurrence; (3) direct the removal of trees from the downstream slope of the embankment; and (4) investigate the seismic stability of the dam. Voids left in the embankment by the removal of trees should be filled with suitable, thoroughly compacted material.

In addition, the Owner should implement the following operational and maintenance procedures: (1) areas on the downstream slope with surface irregularities should be backfilled with suitable, thoroughly compacted materials and provided with suitable vegetative cover; (2) operability of the pond drain sluice gate should be verified, and the gate should be repaired if necessary; (3) develop and implement an ongoing operation and maintenance program; (4) a program of annual periodic technical inspection should be instituted; and (5) a formal surveillance and flood warning plan, including round-the-clock monitoring during heavy precipitation, should be developed.

O'BRIEN & GERE ENGINEERS, INC.



John J. Williams
Vice President
New York Registration No. 050794

Date 28 FEB 1980

This Phase I Inspection Report on Upper Porter Pond Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

RICHARD DIBUONO, MEMBER
Water Control Branch
Engineering Division

ARAMAST MAHTESIAN, MEMBER
Geotechnical Engineering Branch
Engineering Division

CARNEY M. TERZIAN, CHAIRMAN
Design Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of theses guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation: however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The Phase I Investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

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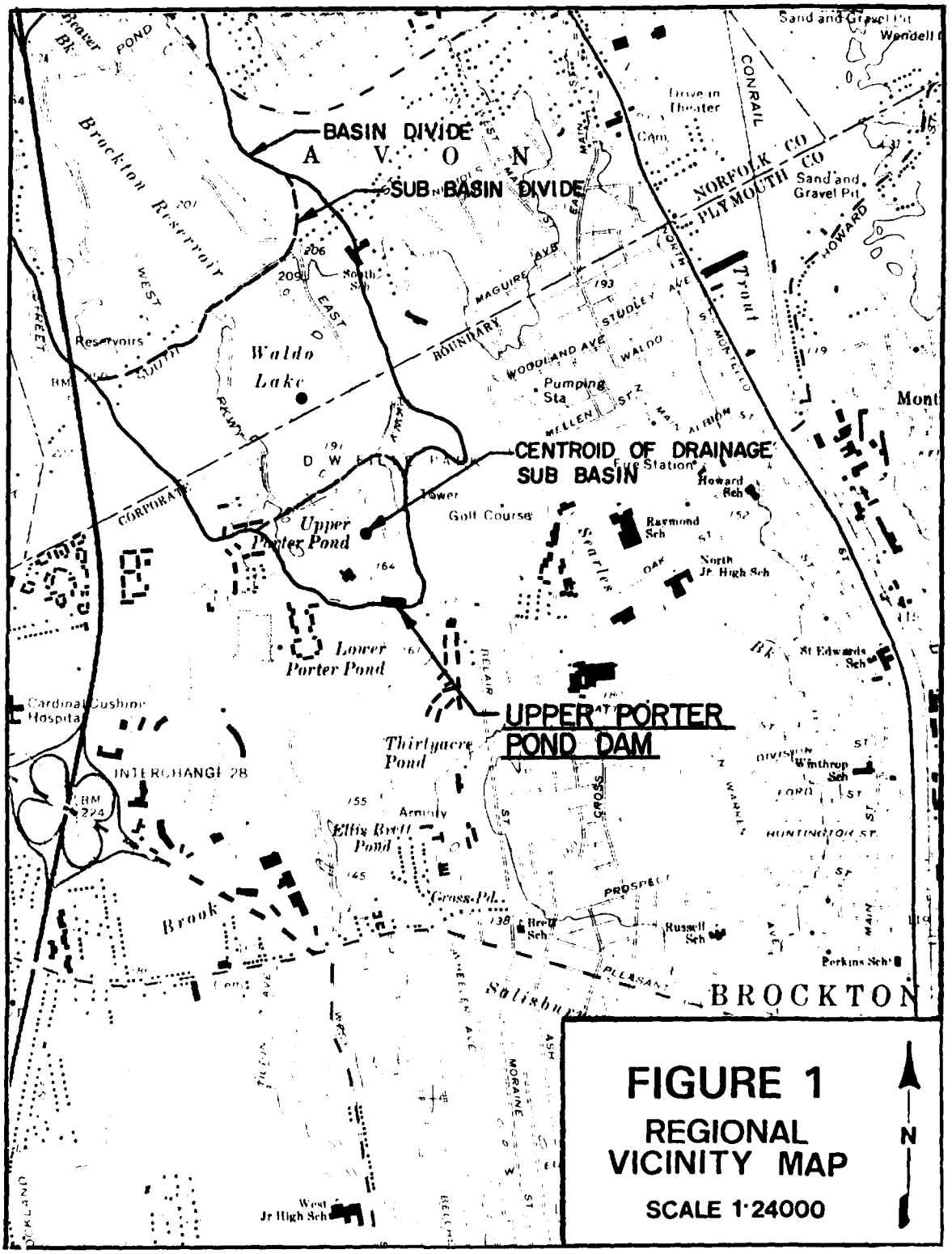
DOWNSTREAM OVERVIEW OF THE UPPER PORTER POND DAM. (10/17/79)

UPSTREAM OVERVIEW OF THE UPPER PORTER POND DAM. (10/17/79)


BASIN DIVIDE
A V O N
SUB BASIN DIVIDE
CENTROID OF DRAINAGE SUB BASIN
UPPER PORTER POND DAM
Brockton Reservoir
Waldo Lake
Upper Porter Pond
Lower Porter Pond
Thirtyacre Pond
Ellis Bell Pond
Brook
Cardinal Cushing Hospital
INTERCHANGE 28
Golf Course
Pumping Sta
Fire Station
Tower
Reservoirs
Drive-in Theater
Sand and Gravel Pit
NORFOLK CO
PLYMOUTH CO
CONRAIL
Raymond Sch
North Jr High Sch
St Edwards Sch
Winthrop Sch
Howard Sch
Russell Sch
Perkins Sch
West Jr High Sch
Armory
BROCKTON
FIGURE 1
REGIONAL VICINITY MAP
SCALE 1:24000
N

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT
UPPER PORTER POND DAM

SECTION I

PROJECT INFORMATION

1.1 General

a. Authority. The National Dam Inspection Act (Public Law 92-367), August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate the National Program for Inspection of Dams throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. O'Brien & Gere Engineers, Inc. has been retained by the New England Division to inspect and report on selected dams in the Commonwealth of Massachusetts. Authorization and Notice to Proceed were issued to O'Brien & Gere Engineers, Inc. by a letter from the Corps of Engineers dated November 6, 1979 and signed by Col. William E. Hodgson, Jr. Contract No. DACW33-80-C-0014 has been assigned by the Corps of Engineers for this work.

b. Purpose of Inspection. The purpose of performing technical inspection and evaluation of non-federal dams is to:

1) Identify conditions which threaten the public safety and make the Owner aware of any deficiencies to permit him to corrent them in a timely manner.

2) Encourage and prepare the states to initiate effective dam safety programs for non-federal dams as soon as possible.

3) Update, verify, and complete the National Inventory of Dams.

1.2 Description of Project (Information for this dam was obtained from the City of Brockton and the Massachusetts Department of Environmental Quality and Engineering (DEQE)

a. Location. Upper Porter Pond Dam is located on Beaver Brook within the City of Brockton, Massachusetts. Lower Porter Pond and Thirty Acre Pond are located downstream of Upper Porter Pond Dam. A 35-home community located about 0.25 miles downstream of Thirty Acre Pond is considered the major damage center. Beaver Brook joins Lovett Brook to form Salisbury Brook about 0.75 miles downstream of Upper Porter Pond and Salisbury Brook joins Trout Brook to form the Salisbury Plain River about 3 miles downstream of Upper Porter Pond. The dam and damage center are shown on the "Brockton, Massachusetts" USGS Quadrangle at coordinates N 42^{o} 06.1' and W 71^{o} 02.6'. A regional vicinity plan of Upper Porter Pond is included as Figure 1, page vi.

b. Description of Dam and Appurtenances. Upper Porter Pond Dam is a gravel and clay fill embankment approximately 340 feet long with a maximum embankment height of 11 feet. The embankment has the following features:

1) The upstream slope of the embankment varies along the length of the dam because of the size and configuration of the spillway at the center of the dam. On either side of the terraced spillway, the upstream slope averages approximately 3H:1V and has a well maintained grass cover.

2) The crest of the dam is approximately 80 feet wide and is almost completely paved due to the presence of Oak Street.

3) The downstream slope of the embankment is approximately 2H:1V from the shoulder of Oak Street to the downstream toe of the dam. The slope is partially covered with grass with areas of rock fill and bare earth. Several small trees are growing on the downstream slope. At the spillway outlet and extending for a distance of approximately 50 feet in either direction, the lower portion of the slope is retained by an inclined stone masonry wall. Photos of the downstream slope have been included on page 3 of Appendix C.

The spillway is located approximately 200 feet left of the right abutment of the dam. The inlet consists of a 25-foot wide broad crested weir with a terraced spillway discharging to a 30-foot diameter stilling pool. From the spillway pool, water flows through a 15-foot wide by 6.75-foot high stone arch under Oak Street to Lower Porter Pond. Sketches of the spillway have been included in Appendix B of this Report.

A low level outlet gate is located approximately 80 feet east of the main spillway inlet. This gate, if operable, will permit draining of the pond via a 48-inch diameter conduit to Lower Porter Pond. A location plan of the low level discharge gate and conduit is included on page 2 of Appendix B.

c. Size Classification. Upper Porter Pond Dam has a maximum embankment height of approximately 11 feet which places it in the "Small" size category for height because it is less than 40 feet high. It also falls into the "Small" size category for storage since the maximum storage capacity is 79 acre-feet which is less than the 1,000 acre-foot limit for "Small" size structures. Therefore, Upper Porter Pond Dam is classified as "Small."

d. Hazard Classification. Upper Porter Pond Dam is located immediately upstream of Lower Porter Pond. Approximately 35 homes are located about 0.25 miles downstream of Thirty Acre Pond Dam which is approximately 2,000 feet downstream of Lower Porter Pond Dam. In addition, the discharge from Thirty Acre Pond passes through two small ponds, a narrow man-made channel approximately one mile long and into a 1,800 foot long underground culvert. The region of potential flooding which borders the man made channel and which is upstream of the culvert is a densely populated urban neighborhood. The dam is classified as "Significant" hazard since flood waters resulting from failure of Upper Porter Pond Dam could cause appreciable property damage but little or no loss of life at the initial downstream damage center. This assessment is based on the breach analysis,

Which computed a stream depth of 1.5 feet at the initial downstream damage center.

e. Ownership. The dam is owned by the City of Brockton, Department of Parks and Recreation, City Hall, Brockton, MA 02401, Telephone 617-580-1100.

f. Operator. Operation and maintenance of the dam is performed under the direction of Mr. John Dorgan, Sr., Commissioner for Daniel W. Field Park. His office is located at City Hall, Brockton, MA 02401, Telephone 617-580-1100.

g. Purpose of Dam. The dam impounds Upper Porter Pond which lies within the D.W. Field Park in the City of Brockton, Massachusetts. The pond was originally constructed and is currently maintained for aesthetic and recreational purposes.

h. Design and Construction History. The dam was constructed in 1940 as a project of the Works Progress Administration. No design and construction data has been located.

Since that time, the only major construction took place in 1968 when new concrete floors were installed on the spillway steps and in the stilling pool.

i. Normal Operating Procedures. No operating records or maintenance information is available according to Mr. John Dorgan, Sr., Park Commissioner. It is not known if the sluice gate is operable. To Mr. Dorgan's knowledge, it has not been operated for several years.

The reservoir is self-regulating with the normal pool slightly above the crest elevation of the spillway.

1.3 Pertinent Data

a. Drainage Area. The area draining into Upper Porter Pond is 3.3 square miles to the north of the dam. The watershed is relatively flat and wooded with some residential developments and low-lying marshes in the upper reaches. Two reservoirs (Brockton Reservoir and Waldo Lake) are located upstream of Upper Porter Pond within the drainage area. The normal pool surface area of the three reservoirs covers approximately 8 percent of the total drainage area.

b. Discharge at Damsite.

1) Outlet Works. Upper Porter Pond may be drained via a gated 48-inch diameter pipe which is located approximately 80 feet to the east of the service spillway. The estimated discharge capacity is about 40 cfs when the reservoir surface is at the top of the dam.

2) Maximum Known Flood At Damsite. There is no known flood data available for this site.

3) Ungated Spillway Capacity at Top of Dam. The total spillway capacity at the top of dam elevation 171.0 is 508 cfs.

4) Ungated Spillway Capacity at Test Flood Elevation. At test flood Elev. 172.4, the spillway capacity is 802 cfs.

5) Gated Spillway Capacity at Normal Pool Elevation. Not Applicable.

6) Gated Spillway Capacity at Test Flood Elevation. Not Applicable.

7) Total Spillway Capacity at Test Flood Elevation. At test flood Elev. 172.4, the spillway capacity is 802 cfs.

8) Total Project Discharge at Top of Dam. The total spillway capacity at the top of dam Elevation 171.0 is 508 cfs.

9) Total Project Discharge at Test Flood Elevation. The combined discharge capacity of the spillway and the flow over the dam at test flood Elev. 172.4 is 2,476 cfs.

c. Elevation. (Feet above NGVD)

Streambed at Toe of Dam	160±
Bottom of Cutoff	NA
Maximum Tailwater	164±
Recreation Pool	167.5
Full Flood Control Pool	NA
Spillway Crest (gated)	NA
Design Surcharge (Original Design)	Unknown
Top of Dam	171.0
Test Flood Pool Design Surcharge	172.4

d. Reservoir Length. (Feet)

Normal Pool	1,300±
Flood Control Pool	NA
Spillway Crest Pool	1,300±
Top of Dam	1,350±
Test Flood Pool	1,400±

e. Storage. (Acre-Feet)

Normal Pool	28
Flood Control Pool	NA
Spillway Crest Pool	28
Top of Dam	79
Test Flood Pool	109

f. Reservoir Surface. (Acres)

Normal Pool	11
Flood Control Pool	NA
Spillway Crest	11
Top of Dam	19
Test Flood Pool	21

g. Dam Data.

Type	Earth embankment
Length	340 feet ±
Height	11 feet ±
Top Width	80 feet ±
Side Slopes (Upstream)	3H:1V
(Downstream)	2H:1V
Zoning	Unknown
Impervious Core	Unknown
Cutoff	Unknown
Grout Curtain	Unknown

h. Diversion and Regulating Tunnel.

Not Applicable

i. Spillways.

Type	Broad crested masonry weir
Length of weir	25 feet
Crest Elevation	167.5
Gates	None
Upstream Channel	None
Downstream Channel	Directed under Oak Street Bridge into Lower Porter Pond

j. Regulating Outlets.

Invert	Elev. 160.0 (estimated)
Size	48-inch diameter
Description	Conduit with sluice gate mechanism on upstream end.
Control Mechanism	Hand operated sluice gate
Other	NA

SECTION 2

ENGINEERING DATA

2.1 Design

The following information was made available for review of Upper Porter Pond Dam:

1. Report entitled "Master Plan Study of D.W. Field Park", April 1968 prepared by Camp, Dresser and McKee, Boston, MA.

2. Dam inspection report prepared by Commonwealth of Massachusetts, DEQE, December, 1972.

3. Drawing for proposed dam construction, 1939.

Notes: The principal design features for this dam are shown on the sketches enclosed in Appendix B.

2.2 Construction

No information is available concerning construction of the dam except that it was part of the Works Progress Administration Program in 1940.

2.3 Operation

According to the Park Commissioner, Mr. John Dorgan, Sr., no operational data is available for this site.

2.4 Evaluation

a. Availability. Engineering data studied and reproduced for this Report was obtained from the following sources:

1) The inspection report and sketches included in Appendix B were obtained from the Commonwealth of Massachusetts, DEQE.

2) Proposed 1939 plans and sections of the dam were obtained from the City of Brockton.

b. Adequacy. Sufficient information has been obtained during the field investigations, from drawings, reports and through subsequent conversations with the Owner's representative to conduct a Phase I dam evaluation.

c. Validity. Based upon field observations, it appears that the drawing dated December 13, 1939, which includes details of the proposed dam construction, is valid.

SECTION 3

VISUAL INSPECTION

3.1 Findings

a. General. The Upper Porter Pond Dam was inspected on October 17, 1979. At the time of inspection, the depth of flow was approximately six inches at the center of the service spillway. Underwater areas were not inspected.

Observations and comments made during the field inspection appear on a checklist included as Appendix A of this report.

b. Dam. The dam appears to be in fair condition with a well-maintained upstream slope consisting of an irregularly shaped lawn area with an average slope of approximately 3H:1V. The area is best illustrated on the overview photos on page v of this report.

The crest of the embankment is almost entirely paved and appears to be in good condition. There is no indication of settlement, pavement cracking, or other defects which could indicate structural deficiencies.

There are several trees, heavy brush and evidence of erosion on the upper portion of the downstream slope of the embankment. The downstream overview photo on page v and the photos shown on page 3 of Appendix C illustrate these features. The downstream embankment slope averages 2H:1V.

c. Appurtenant Structures. The spillway and stone arch culvert appear to be in good condition. At the time of the inspection, the outlet gate was submerged and the handwheel operator was not in place.

d. Reservoir Area. The area surrounding the pond consists primarily of well-maintained grass areas which slope gradually up from the edge of the pond. Portions of the surrounding area are forested.

e. Downstream Channel. Discharge from the spillway flows directly into Lower Porter Pond; it then flows southerly into Thirty Acre Pond, then into Ellis Brett Pond, and finally into Cross Pond. Downstream of Cross Pond, the discharge flows into a narrow man-made channel approximately one mile long and then into a 1,800-foot long underground culvert. Several photographs have been included in Appendix C to illustrate downstream channel conditions.

3.2 Evaluation

The dam appears to be in fair condition. The downstream slope of the embankment shows signs of erosion and is overgrown with heavy vegetation. Photographs 5 and 6 included in Appendix C illustrate these conditions.

SECTION 4

OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 Operational Procedures

a. General. According to Mr. John Dorgan, Sr., Commissioner for D.W. Field Park, no formal operating procedures have been established.

b. Description of Any Warning System in Effect. According to Mr. Dorgan, no flood warning system is in effect for Upper Porter Pond Dam.

4.2 Maintenance Procedures

a. General. Other than periodic mowing of the area just to the north of Oak Street, no maintenance tasks are performed on a routine basis.

b. Operating Facilities. Operability of the low level sluice gate has not been verified. According to Mr. Dorgan, responsibility for maintenance of the facility rests with the Park Commission.

4.3 Evaluation

Current operational procedures are inadequate to ensure operability of the low level sluice gate in an emergency situation. In addition, the maintenance program has not provided for proper maintenance of the downstream slope of the embankment.

SECTION 5

EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 General

Upper Porter Pond Dam has an elongated watershed about 3.8 miles long and 0.9 miles wide. The drainage area is wooded with some residential developments and low-lying marshes in the upper reaches. The topography ranges from Elev. 250 to Elev. 167.5 at the normal (recreation) pool. There are two impoundments upstream of Upper Porter Pond: Brockton Reservoir and Waldo Lake. The normal pool storage capacities of these two reservoirs are about 190 and 180 acre-feet, respectively. It was noted during the visual inspection that the area east of Waldo Lake may be lower in elevation than the top of the dam, thus forming a saddle about 2,000 feet long. Therefore, large inflows into Waldo Lake might be diverted over this saddle into the adjacent watershed. This would in turn reduce the impact of the selected test flood upon Upper Porter Pond Dam and its downstream hazard area.

5.2 Design Data

Neither hydraulic nor hydrologic design data are available for Upper Porter Pond Dam.

5.3 Experience Data

There are no records of high reservoir pools or dam overtoppings at this site.

5.4 Test Flood Analysis

The recommended test flood range for a "Small" size, "Significant" hazard dam is from the 100-year flood to one-half of the Probable Maximum Flood (PMF). Due to the potential for property damage and the possibility of loss of life (although remote) in the downstream damage center, the selected test flood is one-half of the PMF.

Hydrologic and hydraulic calculations were performed with the assistance of the HEC-1-DB computer program. The flood hydrographs were constructed from the Snyder unit hydrographs using average coefficients, an initial infiltration of zero and a constant loss rate of 0.05 inches per hour. The Hop Brook Adjustment Factor was used to reduce the Probable Maximum Precipitation based on the drainage area. The routing sequence consisted of dividing the watershed into sub-basins for each impoundment and routing the inflow hydrographs through each reservoir. Stage vs. Discharge and Stage vs. Storage relationships above the spillway crest and the top of the dam were developed for all 5 dams in the system to obtain outflow hydrographs. All impoundments were assumed to be at their respective spillway crest elevations at the beginning of the storm event. Possible overflow effects to the east of Waldo Lake were not included in the routing procedure.

The test flood peak inflow to Upper Porter Pond was computed as 2,500 cfs. The routed test flood outflow of 2,475 cfs overtopps the embankment by 1.4 feet. The spillway is capable of discharging 508 cfs prior to overtopping to the embankment, which is about 21 percent of the routed test flood outflow.

5.5 Dam Failure Analysis

A failure of the embankment was simulated by the HEC-1-DB computer program assuming a 136-foot wide and 6-foot deep breach with vertical side slopes developing within one hour. The failure is assumed to occur with the reservoir surface at the top of dam elevation. The resulting outflow was routed to the damage center, which was assumed to be the community of approximately 35 homes downstream of Thirty Acre Pond. The channel cross-section utilized in the computer program for the hazard area was taken at a point 1,200 feet downstream of Thirty Acre Pond and is shown on page D-12. The increase in stream depth at this location was computed to be 1.5 feet. This depth of flow could cause appreciable property damage and little or no loss of life in the downstream damage center. In addition, failure of Upper Porter Pond Dam would cause Lower Porter Pond Dam to be overtopped by about 0.2 feet.

SECTION 6

EVALUATION OF STRUCTURAL STABILITY

6.1 Visual Observations

At the time of inspection, no signs of structural instability were observed. The upstream slope of the embankment could be readily observed since it is mowed on a regular basis. The downstream slope could not be observed as easily because of the vegetation, but is appears to be stable with only slight surface irregularities. No cracking or depressions were observed along the crest of the embankment.

The spillway appears to be in good condition. No signs of mortar deterioration, settlement, or seepage were observed. Underwater areas were not inspected.

6.2 Design and Construction Data

The dam, as it now exists, was constructed in 1940 under the Works Progress Administration Program. Prior to that time, there was a road crossing at the site with a stone double arch culvert connecting Upper and Lower Porter Ponds.

According to the D.W. Field Park Commissioner, Mr. John Dorgan, Sr., no design data is available. However, drawings of the proposed dam construction in 1940 were obtained from Mr. John Holmgren, Engineer for the City of Brockton. Portions of these drawings are included in Appendix B.

6.3 Post Construction Changes

The only known construction modification was made in 1968 when concrete was placed on the spillway and stilling pool floors. It appears that the stones on the terraced spillway were re-pointed at the same time.

6.4 Seismic Stability

Upper Porter Pond Dam is located in Seismic Zone 3 on the "Seismic Zone Map of Contiguous States." Therefore, according to the Recommended Guidelines for Safety Inspection of Dams, a seismic stability analysis should be performed as recommended in Section 7.

SECTION 7

ASSESSMENT, RECOMMENDATIONS & REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition. Based upon visual inspection of the site on October 17, 1979, the dam appears to be in fair condition. The upstream slope of the embankment is well maintained with no visible deficiencies. Oak Street, which traverses the dam crest, is also well maintained and appears to be in good condition.

The downstream slope of the embankment is approximately 2H:1V. The lower portion of the slope consists of hand placed riprap which appears to be structurally sound. However, the presence of small trees and heavy vegetation on the upper portion of the slope increases the potential for seepage and introduces the possibility of embankment damage should the trees be uprooted by high winds. In addition, several areas along the downstream slope have developed surface irregularities due to erosion.

The test flood peak inflow to Upper Porter Pond was computed as 2,500 cfs. The routed test flood outflow of 2,475 cfs overtops the embankment by 1.4 feet. The spillway system is capable of discharging 508 cfs prior to overtopping of the embankment, which is about 21 percent of the routed test flood outflow. A failure of the dam would cause a rise in stream elevation of approximately 1.5 feet at the downstream damage area which could result in appreciable property damage but little or no loss of life.

b. Adequacy of Information. Sufficient information has been obtained during the field investigations, from drawings and reports, and through subsequent conversations with the Owner's representative to conduct a Phase I Dam evaluation.

c. Urgency. The recommendations and remedial measures described in this Section should be implemented within one year of receipt of this Phase I Inspection Report.

7.2 Recommendations

The following recommendations should be implemented by a registered professional engineer experienced in the design and construction of dams:

1) A detailed hydrologic and hydraulic study should be made to assess the need for increasing the project discharge capacity.

2) It appears that Waldo Lake, upstream of Upper Porter Pond, could overflow in the area along the D.W. Field East Parkway prior to overtopping the dam crest. A study should be made to examine this possibility and to evaluate the consequences of such an occurrence.

3) The downstream slope of the embankment should be cleared of trees and heavy brush. Any remaining voids in the embankment should be backfilled with suitable, thoroughly compacted material.

4) The seismic stability of the dam should be investigated utilizing conventional equivalent static load methods.

7.3 Remedial Measures

a. Operation and Maintenance Procedures.

1. Areas on the downstream slope with surface irregularities should be backfilled with suitable, thoroughly pacted material and provided with a suitable vegetative cover.

2. Operability of the pond drain sluice gate should be verified and the gate should be repaired if necessary. The gate operator should be stored in a convenient location for emergency use.

3. Develop and implement an ongoing operation and maintenance program.

4. A program of annual periodic technical inspection should be instituted.

5. A formal surveilance and flood warning plan, including round-the-clock monitoring during heavy precipitation, should be developed.

7.4 Alternatives

As an alternative to the above recommendations and remedial measures, the dam could be breached and the pond drained.

APPENDIX A

INSPECTION CHECKLIST

VISUAL INSPECTION CHECK LIST

INSPECTION TEAM ORGANIZATION

Project: Upper Porter Pond Dam

National I.D. #: MA 00425

Location: Brockton, Mass.

Type of Dam: Earth Embankment

Inspection Date(s): October 17, 1979

Weather: Clear, Warm, Mid 60's

Pool Elevation: 167.5± MSL

Inspection Team

Leonard Beck	O'Brien & Gere	Structures
Steven Snider	O'Brien & Gere	Foundations & Materials
Alan Hanscom	O'Brien & Gere	Structures
Rodney Georges	Bryant & Associates	Hydrology/Hydraulics

*Mr. John J. Williams, Vice-President, O'Brien & Gere has visited the site but not necessarily in conjunction with the inspection team.

Owner's Representative

Mr. John Dorgan, Sr.; Park Commissioner;

D.W. Field Park; Brockton, Mass.

VISUAL INSPECTION CHECK LIST

Project: Upper Porter Pond Dam

National I.D. #: MA 00425

Date(s): October 17, 1979

AREA EVALUATED	CONDITIONS
DAM EMBANKMENT	
Crest Elevation	171.0
Current Pool Elevation	167.5
Maximum Impoundment to Date	Unknown
Surface Cracks	None Observed
Pavement Condition	Top of dam road surface in good condition.
Movement or Settlement of Crest	None Observed
Lateral Movement	None Observed
Vertical Alignment	No vertical misalignment observed
Horizontal Alignment	No horizontal misalignment observed
Condition at Abutment and at Concrete Structures	Satisfactory, no settlement or erosion observed.
Indications of Movements of Structural Items on Slopes	None observed
Trespassing on Slopes	Downstream slope shows indications
Vegetation on Slopes	Good upstream, poor downstream with bare areas & trees growing on slope.
Sloughing or Erosion of Slopes or Abutments	Downstream shows erosion indications in bare areas.
Rock Slope Protection - Riprap Failures	None observed

VISUAL INSPECTION CHECK LIST

Project: Upper Porter Pond Dam

National I.D. #: MA 00425

Date(s): October 17, 1979

AREA EVALUATED	CONDITIONS
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	
General Condition	Good
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	None
Floor of Approach Channel	Concrete - very good
b. Weir and Training Walls	
General Condition of Concrete	Stone masonry - good cond.
Rust or Staining	None
Spalling	NA
Any Visible Reinforcing	NA
Any Seepage or Efflorescence	None observed
Drain Holes	None observed
c. Discharge Channel	
General Condition	Very Good

VISUAL INSPECTION CHECK LIST

Project: Upper Porter Pond Dam

National I.D. #: MA 00425

Date(s): October 17, 1979

AREA EVALUATED	CONDITIONS
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS (Con't)	
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	None
Floor of Channel	Spillway Floor - new (1968)
Other Obstructions	None observed
Miscellaneous	Stone arch culvert - good condition w/ concrete floor

VISUAL INSPECTION CHECK LIST

Project: Upper Porter Pond Dam

National I.D. #: MA 00425

Date(s): October 17, 1979

AREA EVALUATED	CONDITIONS
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
a. Approach Channel	
Slope Conditions	Unknown, Submerged
Bottom Conditions	Unknown, Submerged
Rock Slides or Falls	None
Log Boom	NA
Debris	None
Condition of Concrete Lining	Appears very good.
Drains or Weep Holes	None
b. Intake Structure	
Condition of Concrete	Stone Masonry - good cond.
Stop Logs and Slots	NA

VISUAL INSPECTION CHECK LIST

Project: Upper Porter Pond Dam

National I.D. #: MA 00425

Date(s): October 17, 1979

AREA EVALUATED	CONDITIONS
OUTLET WORKS - TRANSITION AND CONDUIT	
General Condition of Concrete	Stone masonry - good cond.
Rust or Staining on Concrete	NA
Spalling	NA
Erosion or Cavitation	None
Cracking	None observed
Alignment of Monoliths	NA
Alignment of Joints	NA
Numbering of Monoliths	NA

APPENDIX B

ENGINEERING DATA

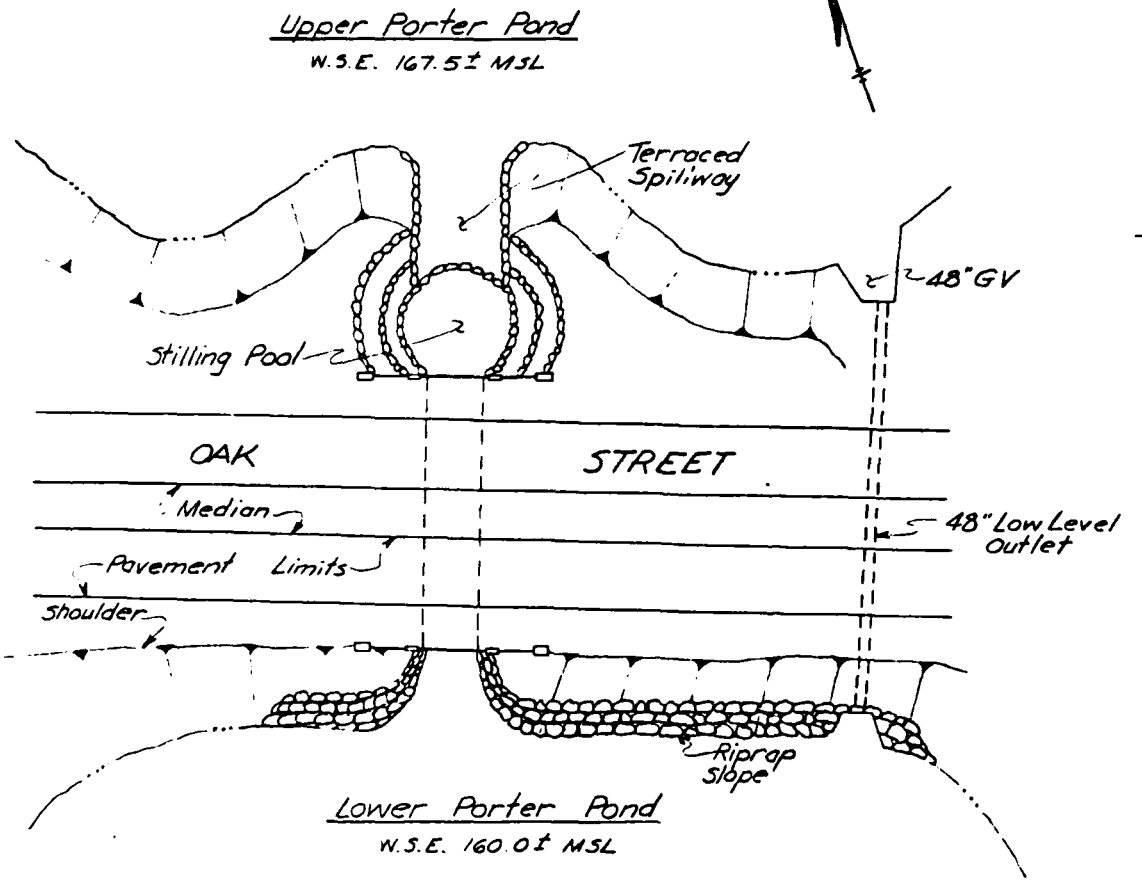
O'BRIEN & GERE
ENGINEERS, INC.

SUBJECT	SHEET	BY	DATE	JOB NO
UPPER PORTER POND DAM				

APPENDIX B

ENGINEERING DATA

TABLE OF CONTENTS

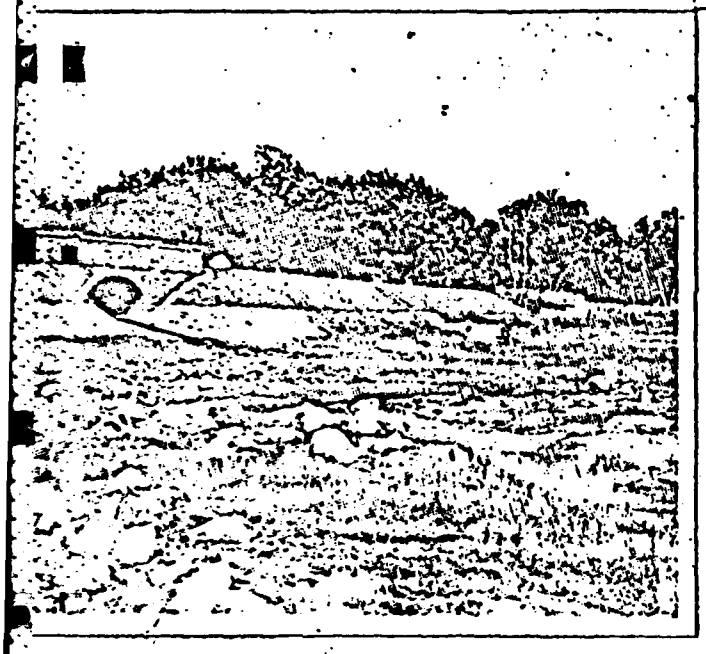


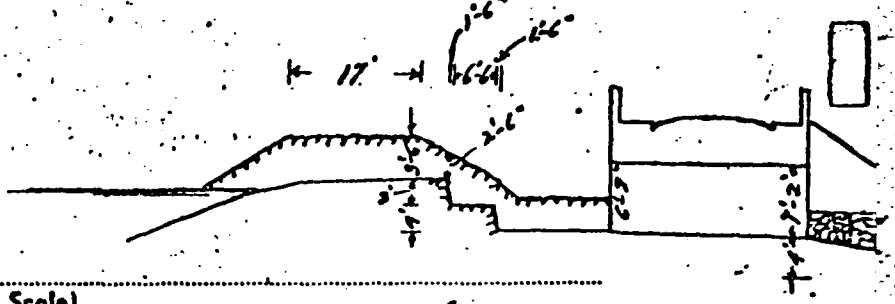
GENERAL DAM DATA

a.) Type - Earth Embankment
b.) Length - 340 feet
c.) Height - 11 fe ±
d.) Top Width - 80 feet
e.) Side Slopes - U/S ~ 3H : 1V
D/S ~ 2H : 1V

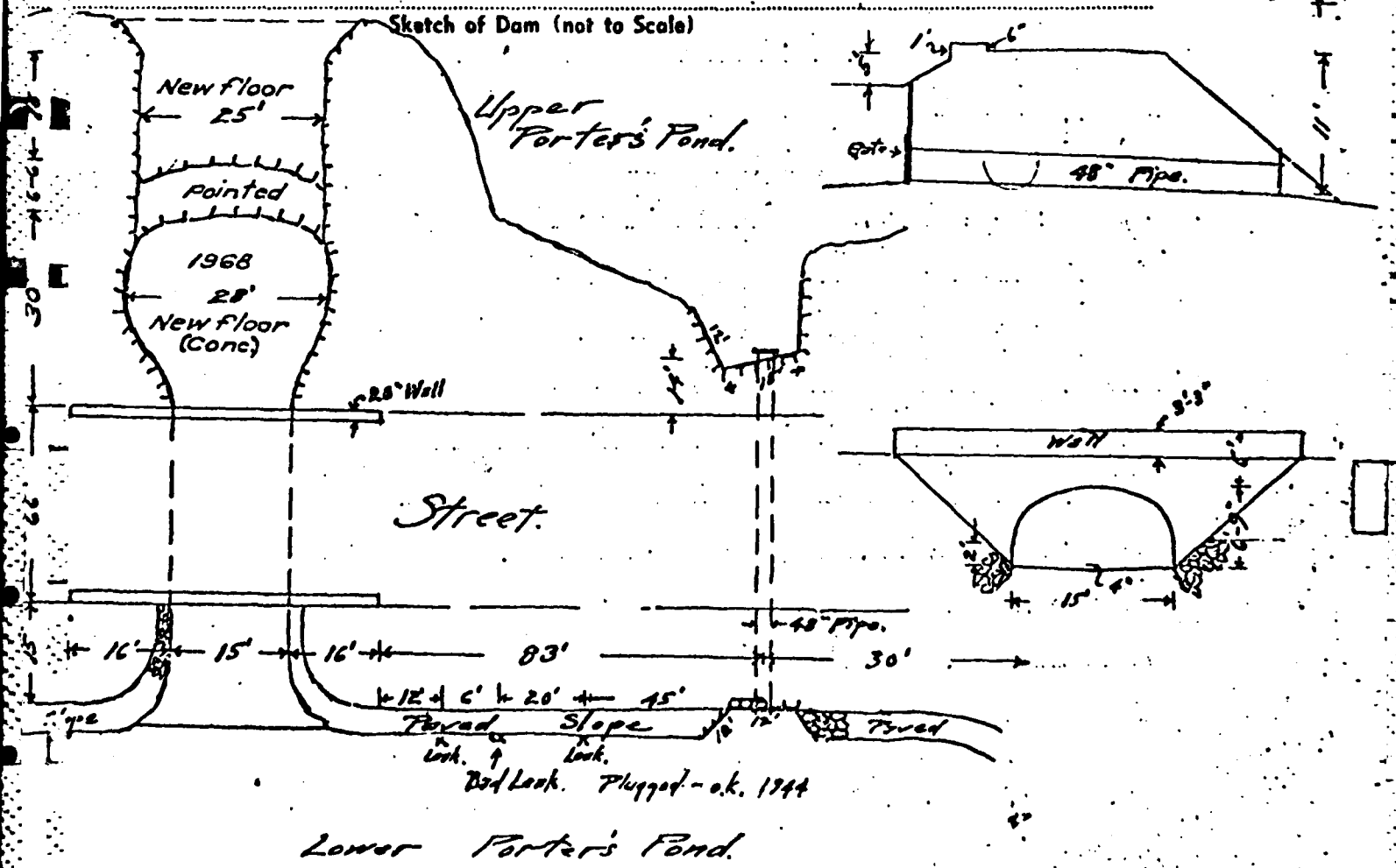
U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		
Contract No. DACW 33-80-C-0014 UPPER PORTER POND DAM		
SITE PLAN		
O'BRIEN & GERE	DATE: JANUARY 1980 SCALE: NONE	B-1

7-12-44-8





Sketch of Dam (not to Scale)



From Commonwealth of Massachusetts DEQE Files Exhibit 2

B-2

DESCRIPTION OF DAM

DISTRICT 7

Submitted by A. DUGAN Dam No. 7-12-44-8

Date 12-5-72 City/~~Town~~ BROCKTON

Name of Dam UPPER PORTER POND

1. Location: Topo Sheet No. 32 D

Provide 8½" x 11" in clear copy of topo map with location of Dam clearly indicated.

2. Year Built 1939 - 1940 Year/s of Subsequent Repairs _____

3. Purpose of Dam: Water Supply _____ Recreational X

Irrigation _____ Other _____

4. Drainage Area: 7 Sq.Mi. _____ Acres

5. Normal Ponding Area: _____ Acres _____ Ave.Depth

Impoundment: 7,000,000 Gals. _____ Acre Ft.

6. No. and Type of Dwellings Located Adjacent to Pond or Reservoir

i.e. Summer Homes, etc. NONE

7. Dimensions of Dam: Length 340' Max. Height 11'

Slopes: Upstream Face 4'

Downstream Face 6'

Width Across Top 80'

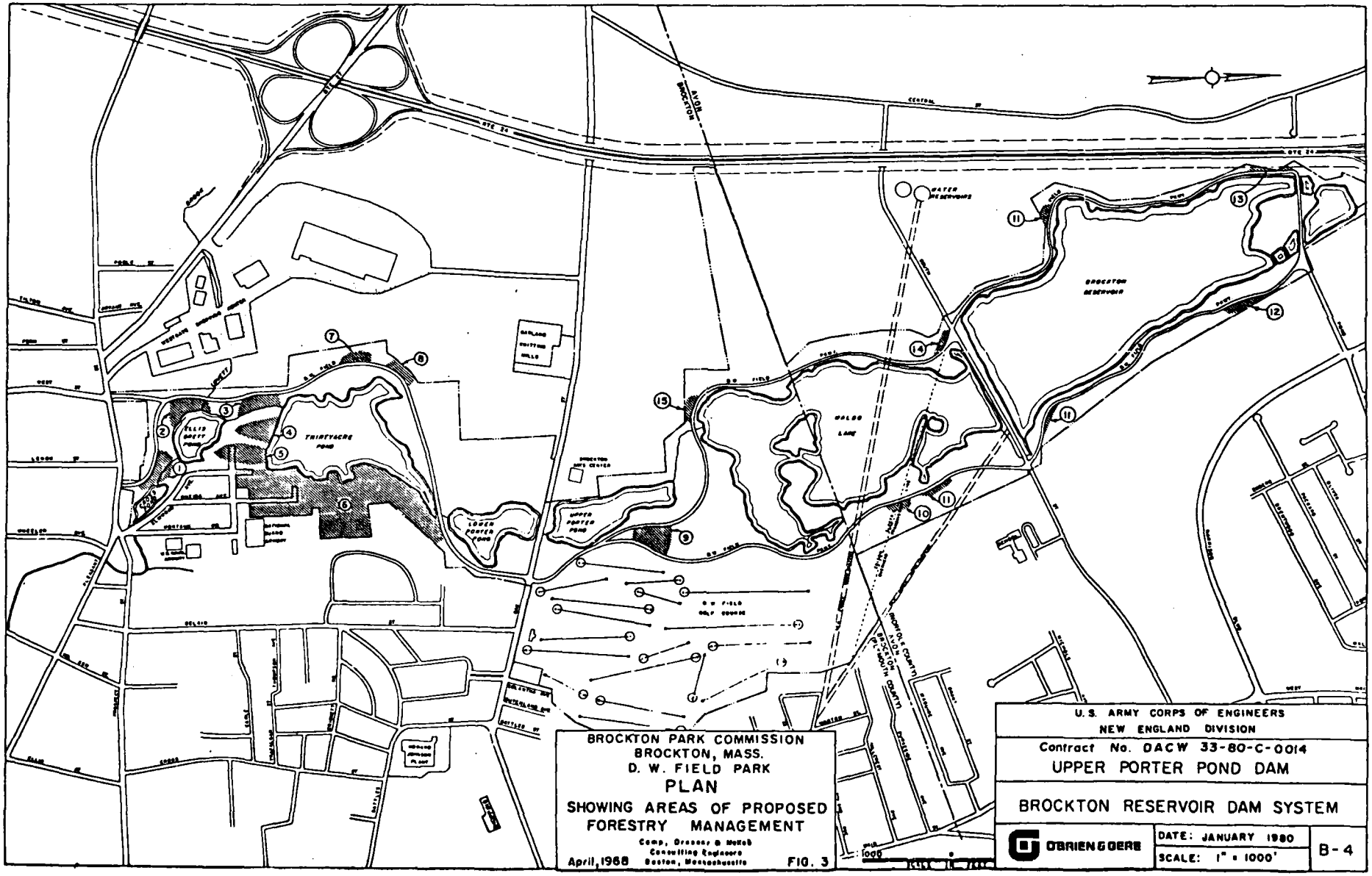
8. Classification of Dam by Material:

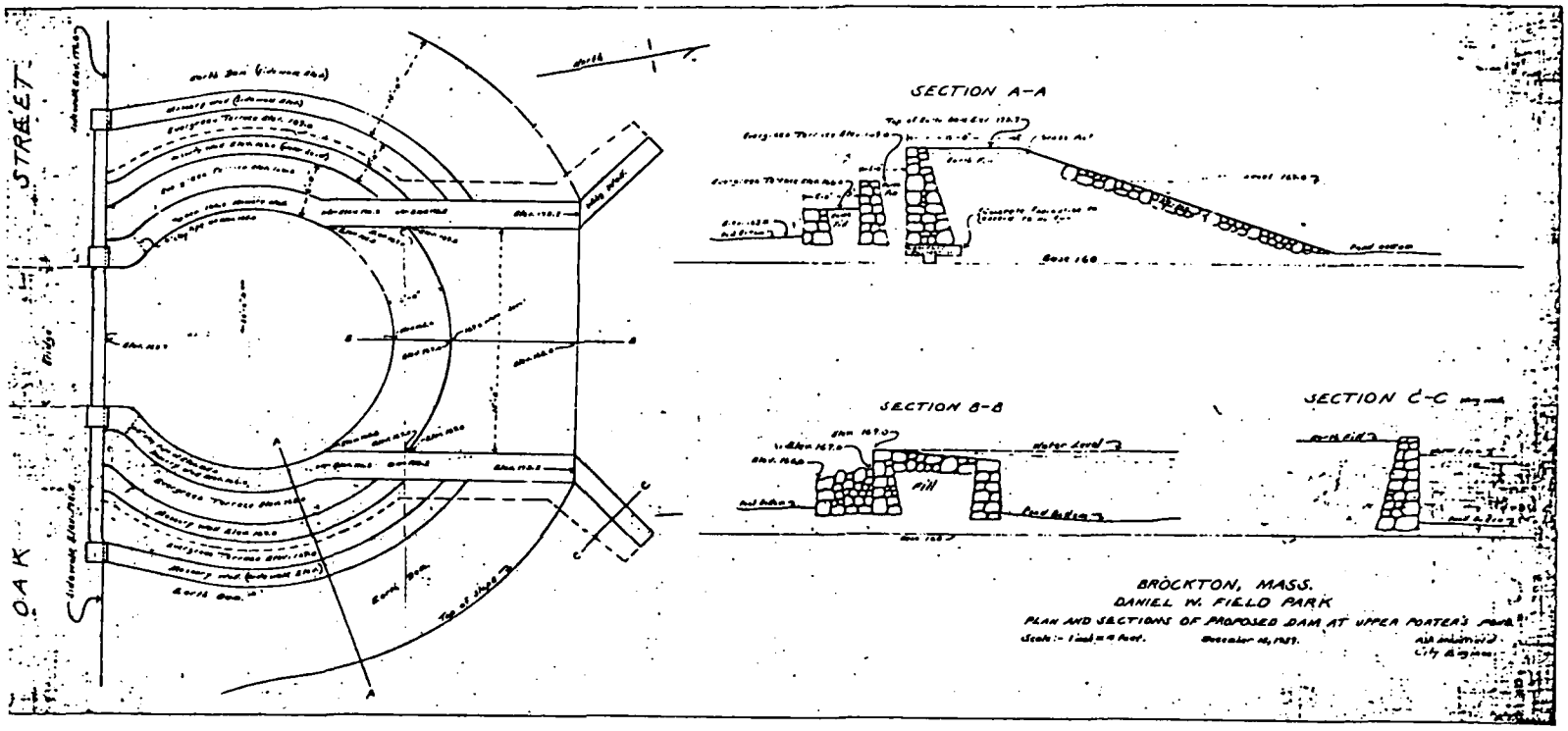
Earth X Conc. Masonry _____ Stone Mason. _____

Timber _____ Rockfill _____ Other _____

Exhibit 1

From Commonwealth of Massachusetts DEQE Files


BROCKTON PARK COMMISSION
BROCKTON, MASS.
D. W. FIELD PARK
PLAN
SHOWING AREAS OF PROPOSED
FORESTRY MANAGEMENT
Camp, Dresser & McKee
Consulting Engineers
April, 1968 Boston, Massachusetts
FIG. 3
U. S. ARMY CORPS OF ENGINEERS
NEW ENGLAND DIVISION
Contract No. DACW 33-80-C-0014
UPPER PORTER POND DAM
BROCKTON RESERVOIR DAM SYSTEM
O'BRIEN & GERE
DATE: JANUARY 1980
SCALE: 1" = 1000'
B-4

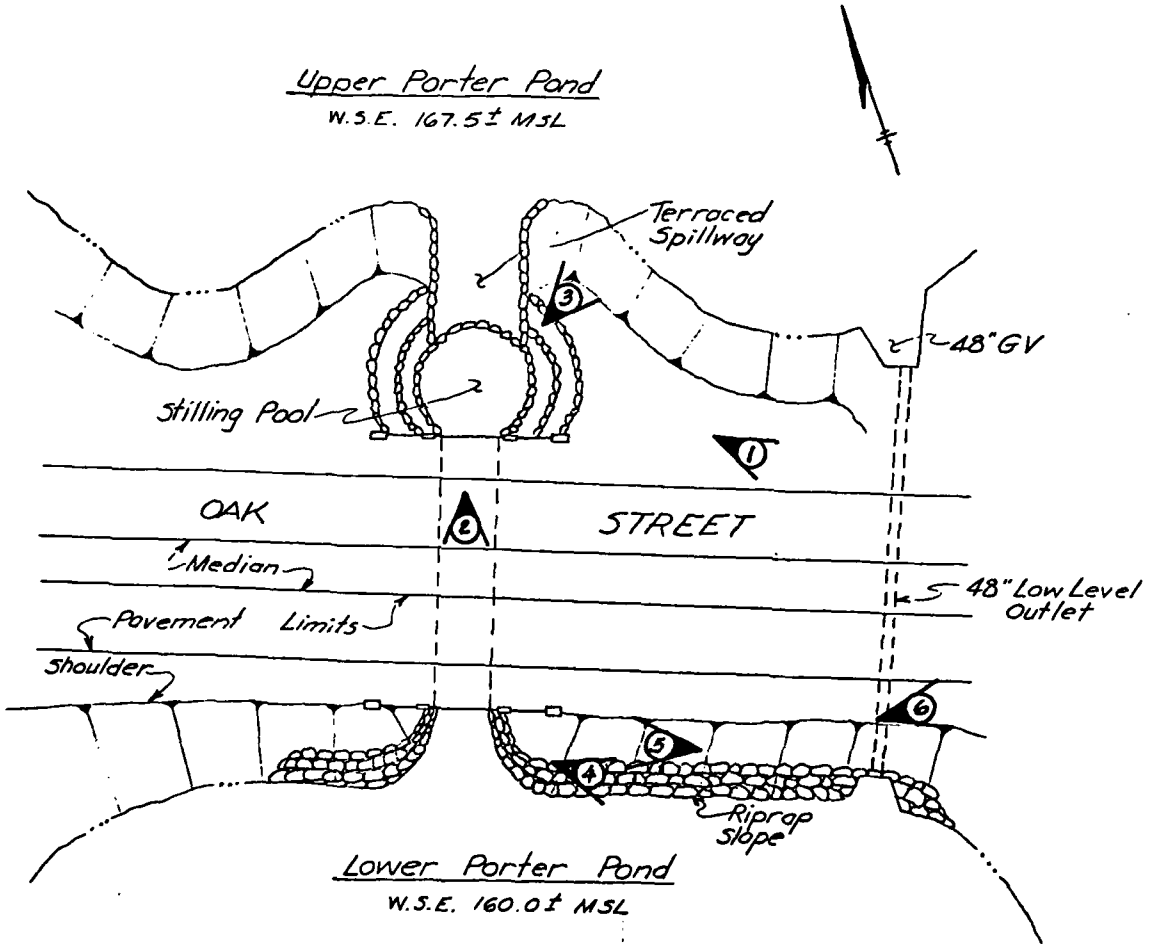


U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		
Contract No. DACW 33-80-C-0014 UPPER PORTER POND DAM		
SITE PLAN & SPILLWAY SECTIONS		
O'BRIEN & GERE	DATE: JANUARY 1980 SCALE: NONE	B-5

APPENDIX C

PHOTOGRAPHS

APPENDIX C
SELECTED PHOTOGRAPHS OF PROJECT



GENERAL DAM DATA

a.) Type - Earth Embankment
b.) Length - 340 feet
c.) Height - 11 feet
d.) Top Width ≈ 80 feet
e.) Side Slopes - U/S ≈ 3H : 1V
D/S ≈ 2H : 1V

LEGEND

① THE LOCATION AND DIRECTION IN WHICH EACH PHOTOGRAPH WAS TAKEN AND THE NUMBER OF THE PHOTOGRAPH

U.S. ARMY CORPS OF ENGINEERS
NEW ENGLAND DIVISION

Contract No. DACW 33-80-C-0014

UPPER PORTER POND DAM

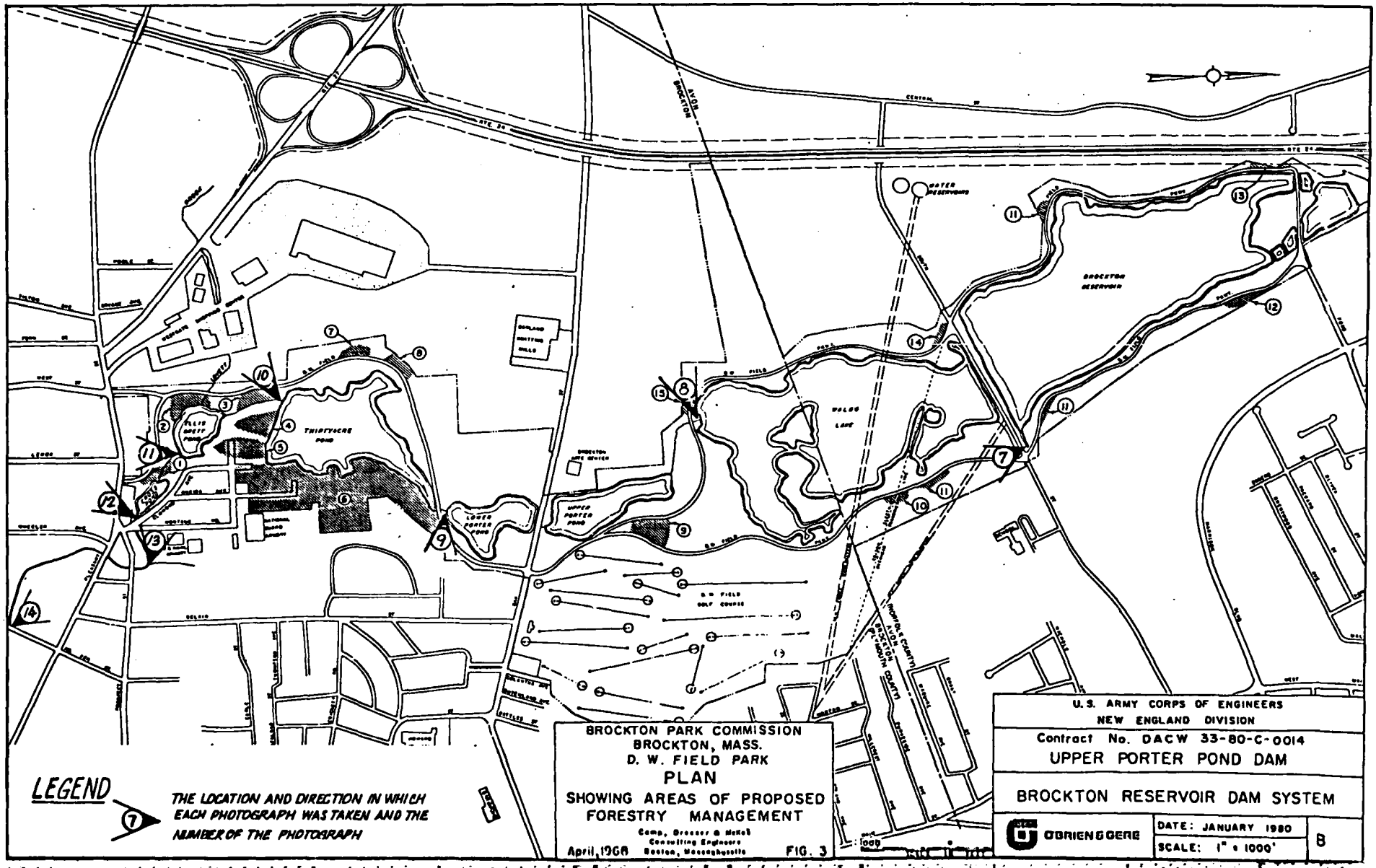
SITE PLAN

O'BRIEN & GERE

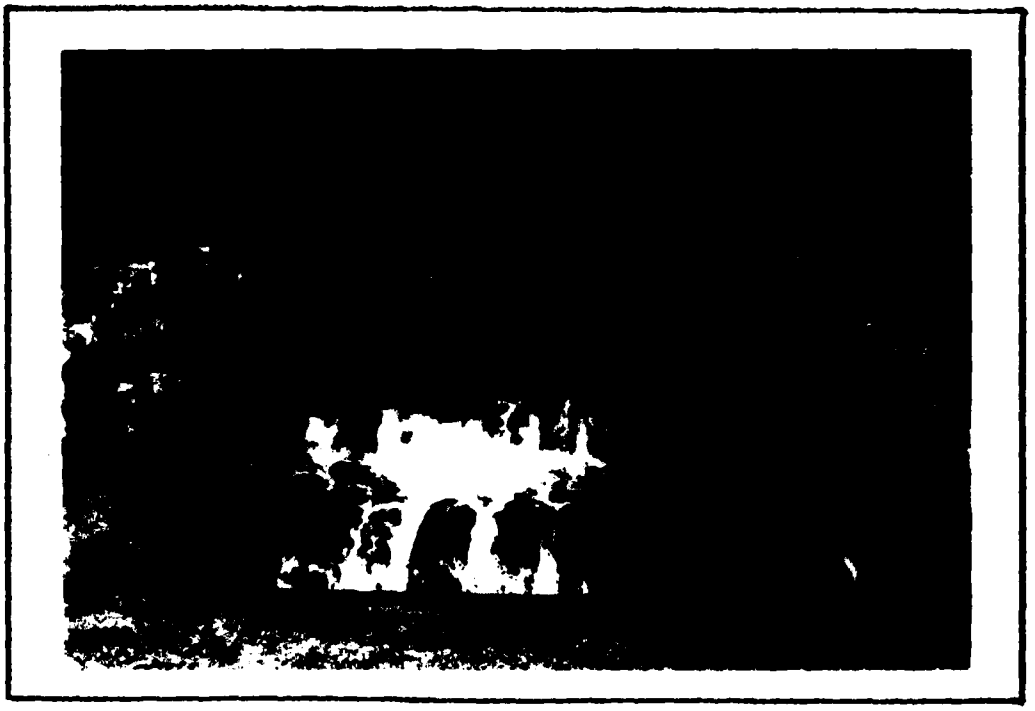
DATE: JANUARY 1980

SCALE: NONE

A


LEGEND
THE LOCATION AND DIRECTION IN WHICH EACH PHOTOGRAPH WAS TAKEN AND THE NUMBER OF THE PHOTOGRAPH
BROCKTON PARK COMMISSION
BROCKTON, MASS.
D. W. FIELD PARK
PLAN
SHOWING AREAS OF PROPOSED
FORESTRY MANAGEMENT
Camp, Dresser & McKee
Consulting Engineers
Boston, Massachusetts
April, 1968
FIG. 3
U.S. ARMY CORPS OF ENGINEERS
NEW ENGLAND DIVISION
Contract No. DACW 33-80-C-0014
UPPER PORTER POND DAM
BROCKTON RESERVOIR DAM SYSTEM
O'BRIEN & GERE
DATE: JANUARY 1980
SCALE: 1" = 1000'
8

1. SPILLWAY AS VIEWED LOOKING NORTHWEST. (10/17/79)



2. SPILLWAY AS VIEWED LOOKING UPSTREAM. (10/17/79)

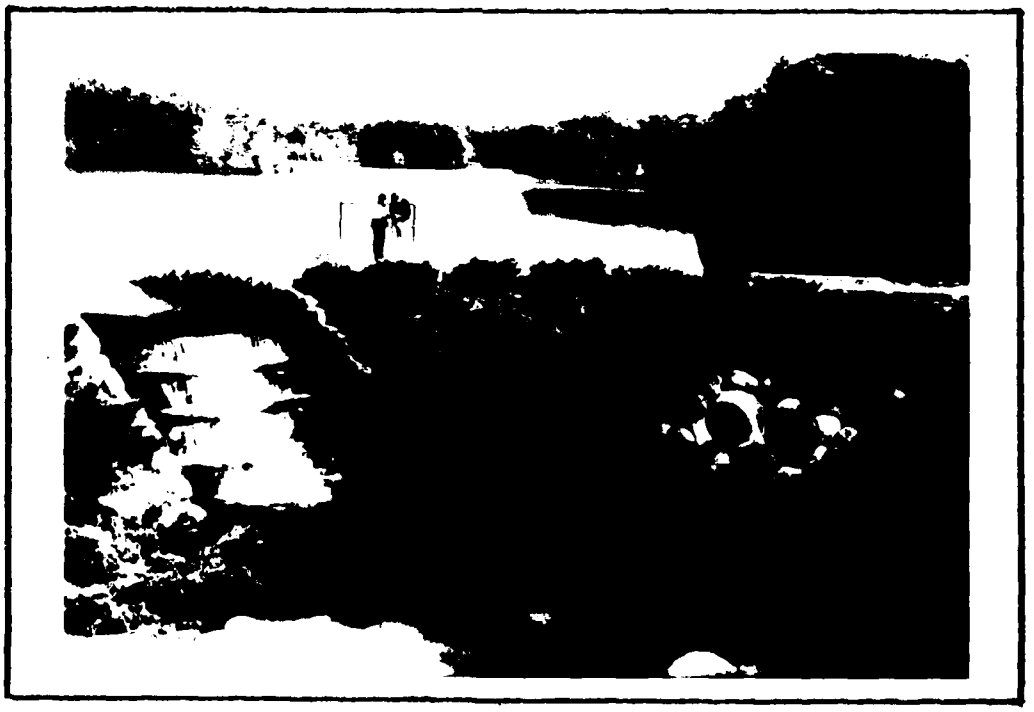
3. BRIDGE BUILT IN THE DAM DOWNSTREAM OF THE SPILLWAY.(10/17/79)

4. DOWNSTREAM OF THE BRIDGE WHICH IS DOWNSTREAM OF THE SPILLWAY. (10/17/79)

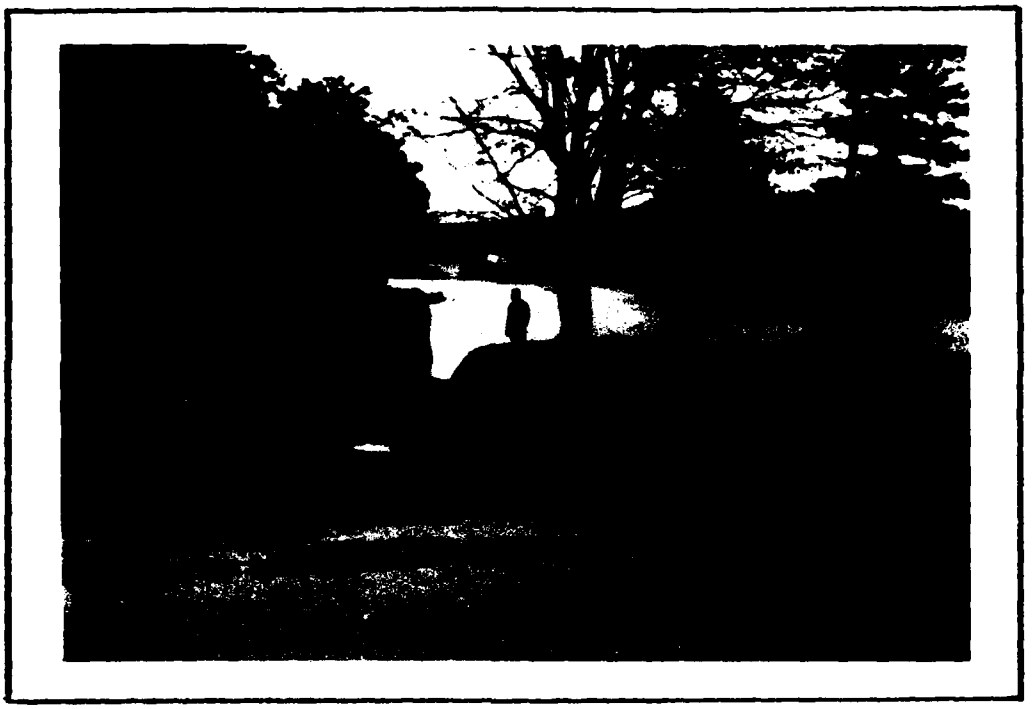
5. DOWNSTREAM SLOPE OF THE DAM SHOWING LOWER PORTER POND TO THE RIGHT. (10/17/79)

6. VARYING CONDITIONS OF THE DOWNSTREAM SLOPE OF THE DAM. (10/17/79)

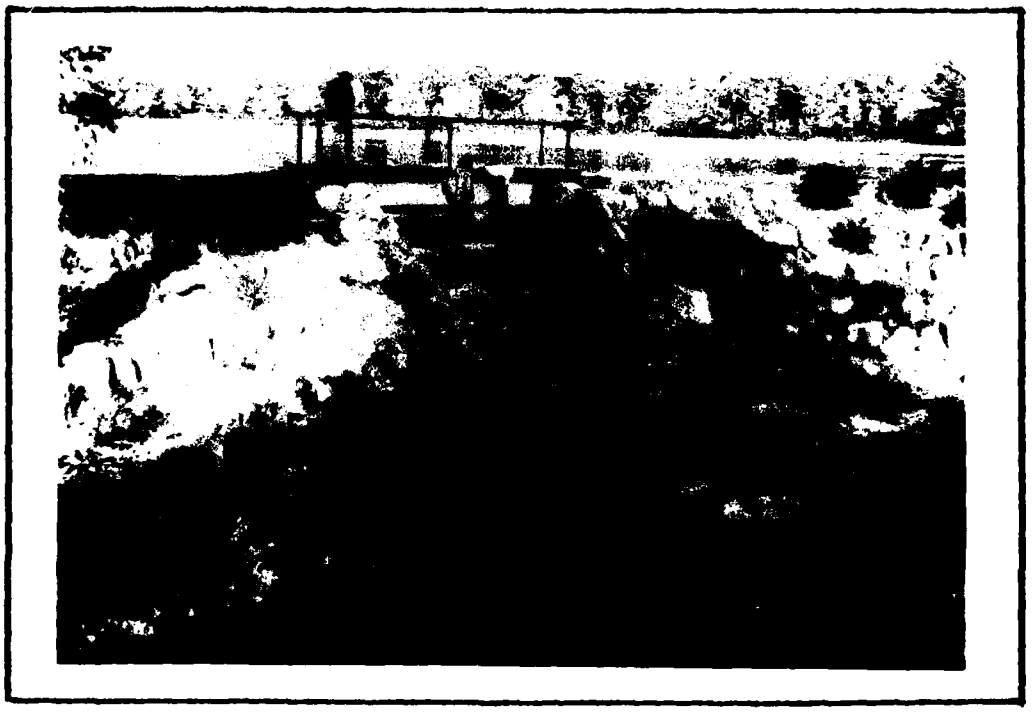
7. BROCKTON RESERVOIR DAM SPILLWAY ABOUT ONE MILE UPSTREAM OF UPPER PORTER POND DAM. (10/17/79)



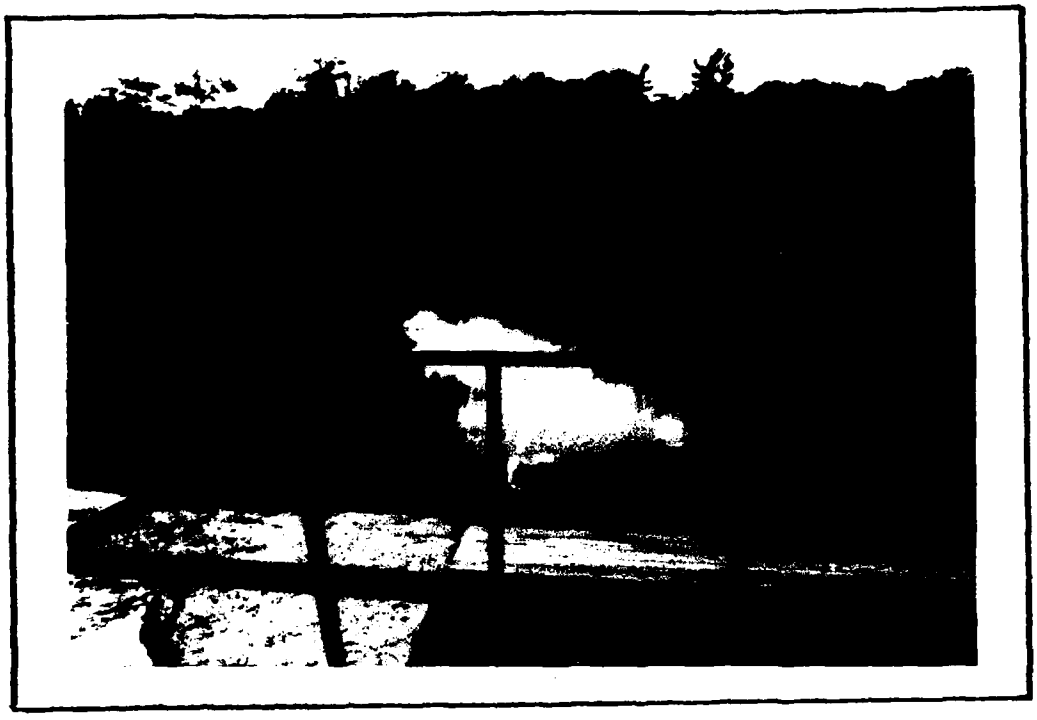
8. WALDO LAKE DAM SPILLWAY APPROXIMATELY 700 YARDS UPSTREAM OF UPPER PORTER POND DAM. (10/17/79)



9. LOWER PORTER POND DAM APPROXIMATELY 350 YARDS DOWNSTREAM OF UPPER PORTER POND DAM.



10. 30 ACRE POND DAM SPILLWAY ABOUT 1050 YARDS DOWNSTREAM OF UPPER PORTER POND DAM. (10/17/79)



11. E. BRETT POND (DRAINED) INLET STRUCTURE ABOUT 1500 YARDS DOWNSTREAM OF UPPER PORTER POND DAM.

12. CROSS POND SPILLWAY APPROXIMATELY 1800 YARDS DOWNSTREAM OF UPPER PORTER POND DAM. (10/17/79)

13. TYPICAL REACH OF SALISBURY BROOK CHANNEL BETWEEN ONE AND TWO MILES DOWNSTREAM OF UPPER PORTER POND DAM. (10/17/79)

14. ENTRANCE TO APPROXIMATELY 600 YARD LONG BOX CULVERT FOR SALISBURY BROOK IN BROCKTON ABOUT TWO MILES DOWNSTREAM OF UPPER PORTER POND DAM. (10/17/79)

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

O'BRIEN & GERE
ENGINEERS, INC.

SUBJECT	SHEET	BY	DATE	JOB NO
UPPER PORTER POND DAM				

APPENDIX D

HYDROLOGIC & HYDRAULIC COMPUTATIONS

TABLE OF CONTENTS

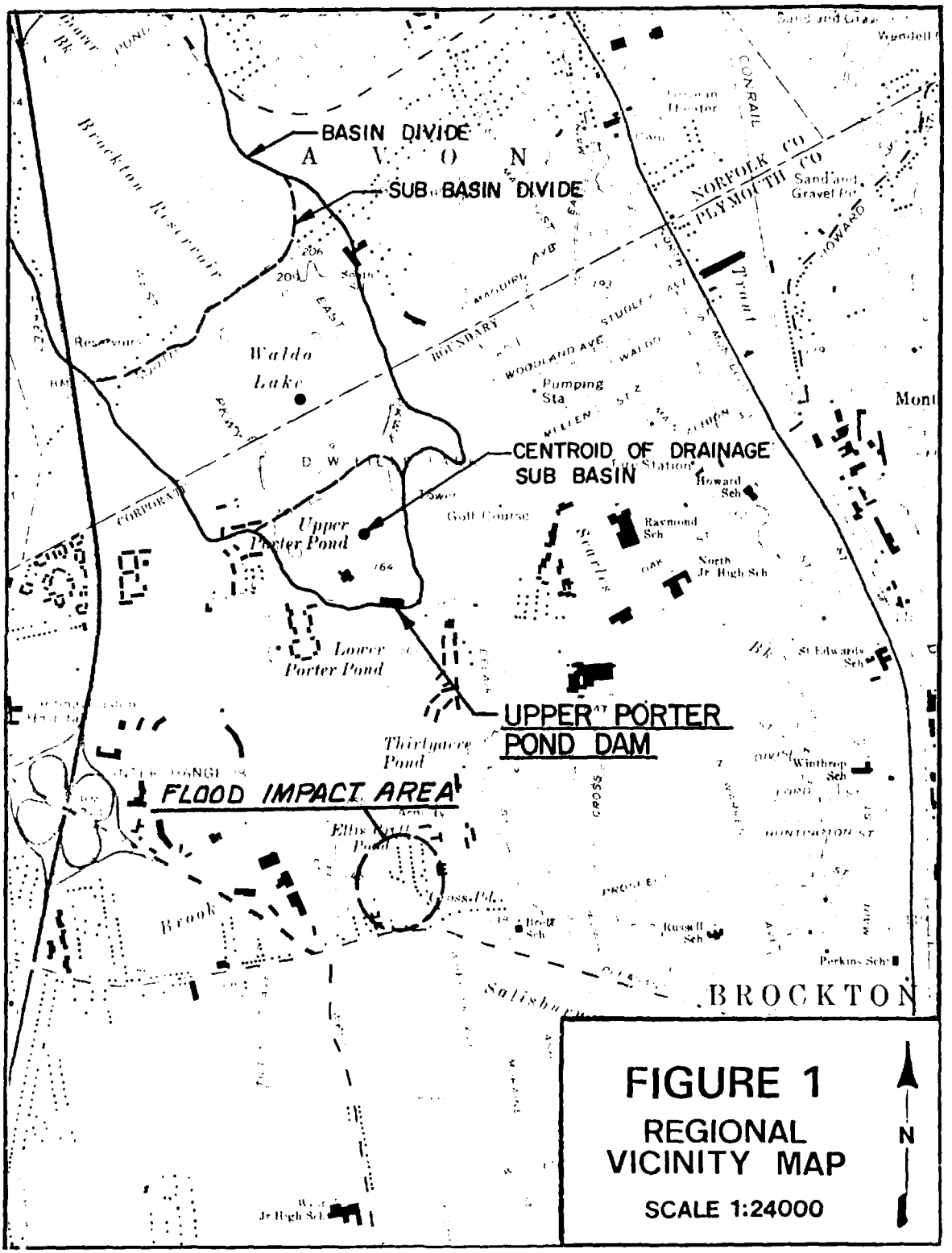


FIGURE 1

REGIONAL VICINITY MAP

SCALE 1:24000

BRYANT ASSOCIATES, INC.
648 Beacon Street
BOSTON, MASSACHUSETTS 02215
(617) 247-1800

JOB NED-COE, UPPER PORTER POND DAM
SHEET NO D-2 OF
CALCULATED BY RG DATE
CHECKED BY SHS DATE
SCALE

UPPER PORTER DAM - H & H

1/

SUBDRAINAGE AREA = 0.11 Sq.Mi

SNYDER HYDROGRAPH COEFFICIENTS

$C_t = 2.0$ $C_p = 0.5$

T_p COMPUTATIONS

$L = 0.44$ MILES $L_{ca} = 0.22$ MILES

$T_p = C_t \cdot (L \times L_{ca})^{.3}$

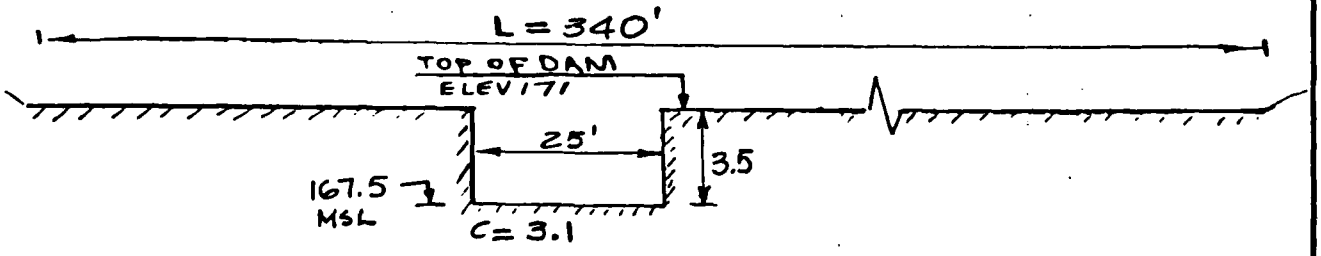
$T_p = 2 \times (.44 \times .22)^{.3} \simeq$ 1.0 Hour

PMP DATA

FROM HMS #33 THE 24 HOUR 200 SqMi INDEX RAINFALL IS 21.5

6hr. % OF INDEX FOR THIS BASIN = 111
12hr. % " " " " " = 124
24hr. % " " " " " = 133

DAM ELEVATION & LENGTH and SPILLWAY DIMENSIONS SKETCH



C = 2.8 TOP OF DAM

LOOKING DOWNSTREAM

D-2

BRYANT ASSOCIATES, INC.
648 Beacon Street
BOSTON, MASSACHUSETTS 02215
(617) 247-1800

JOB NED-COE, UPPER PORTER POND DAM
SHEET NO D- 3 OF
CALCULATED BY RG DATE
CHECKED BY SHS DATE
SCALE

UPPER PORTER DAM - H&H

STAGE DISCHARGE

(H=0 @ SPILLWAY CREST) ELEVATION = 167.5 MSL.

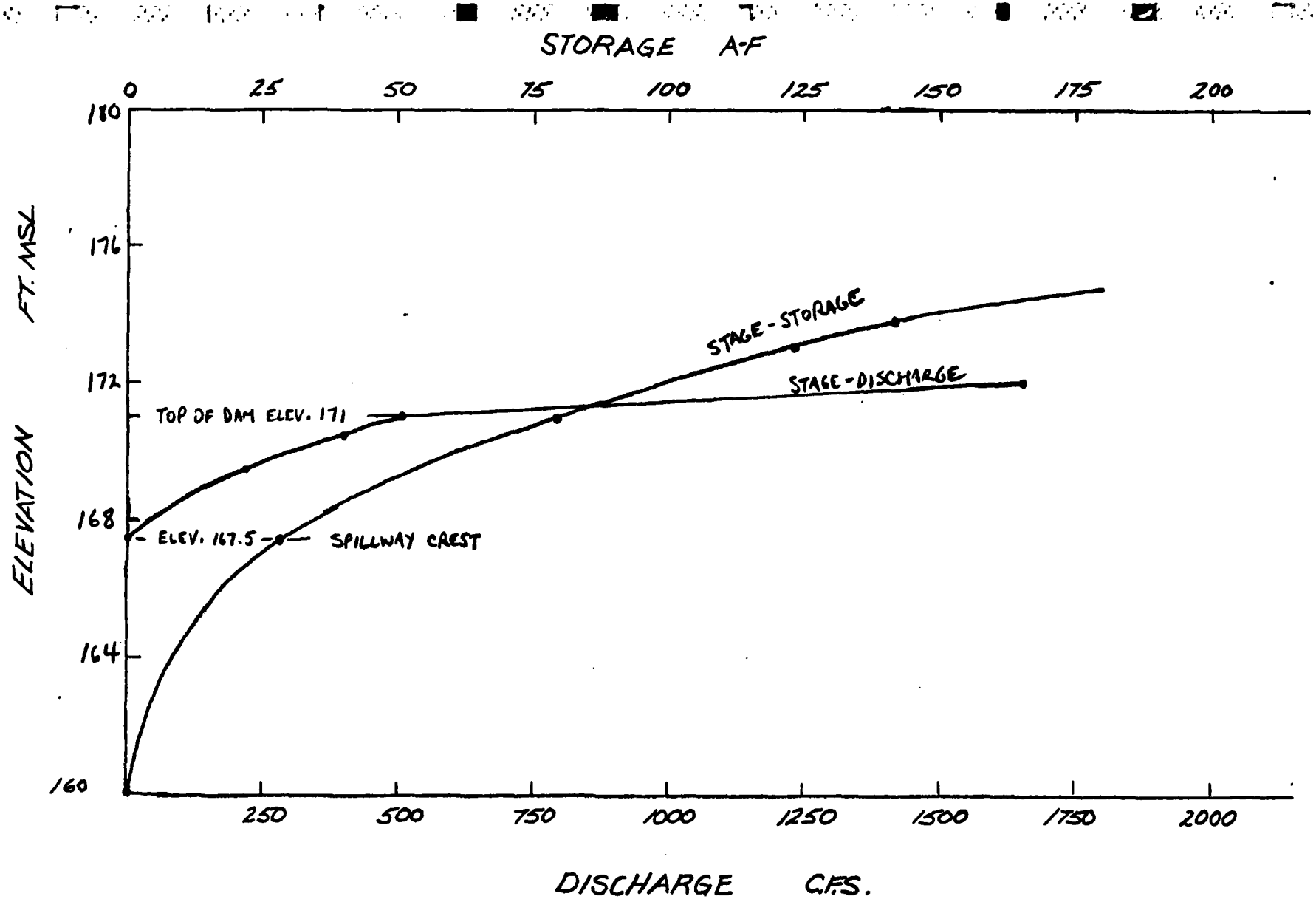
1) SPILLWAY: $C = 3.1$ $L = 25'$ $Q_S = CLH^{1.5}$

2) TOP OF DAM: $C = 2.9$ $L = 340 - 25 = 315$ $Q_{TOP} = CL(H-3.5)^{1.5}$

ELEVATION MSL	H Ft.	Q_S CFS	Q_{TOP} CFS	ΣQ CFS
167.5	0	0	0	
168.5	1	78	0	78
169.5	2	219	0	219
170.5	3	403	0	403
171.0	3.5	508	0	508
172.0	4.5	740	913	1,653
173.0	5.5	1,000	2,584	3,584
174.0	6.5	1,284	4,747	6,031
175.0	7.5	1,592	7,308	8,900
176.0	8.5	1,921	10,213	12,134

STORAGE

	ELEV. (MSL)	AREA (AC) (PLANIMETERED FROM USGS)	STORAGE (AC. FEET) (COMP. BY HEC-1 PROGRAM)
	160	0	0
NORMAL POOL	167.5	11	28
TOP OF DAM	171	19	79



UPPER PORTER POND DAM

STAGE VS. STORAGE

STAGE VS. DISCHARGE

APPENDIX D

BRYANT ASSOCIATES, INC.
648 Beacon Street
BOSTON, MASSACHUSETTS 02215
(617) 247-1800

JOB NED-COE, UPPER PORTER POND DAM
SHEET NO. D-5 OF
CALCULATED BY RG DATE
CHECKED BY SHS DATE
SCALE

BROCKTON LAKE DAM - H & H

1/

DRAINAGE AREA = 2.8 Sq.Mi

SNYDER HYDROGRAPH COEFFICIENTS

$C_t = 2.0$ $C_p = 0.5$

T_p COMPUTATIONS

$L = 2.70$ MILES $L_{ca} = 1.40$ MILES.

$T_p = C_t \cdot (L \times L_{ca})^{.3}$

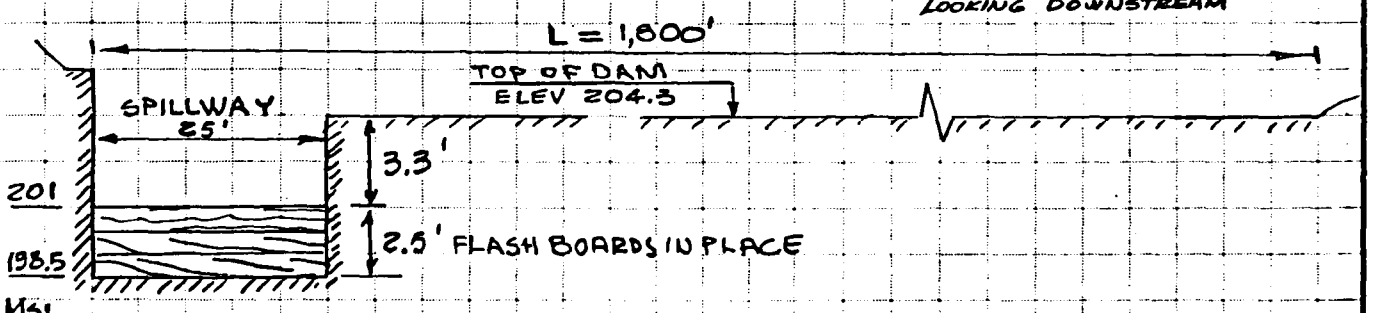
$T_p = 2.0 \times (2.7 \times 1.4)^{.3} = \underline{3.0}$ HOURS

PMP DATA

FROM HMS #33 THE 24 HOUR 200 SqMi INDEX RAINFALL IS 21.5

6hr. % OF INDEX FOR THIS BASIN = 111
12hr. % " " " " " = 124
24hr. % " " " " " = 133

DAM ELEVATION & LENGTH and SPILLWAY DIMENSIONS SKETCH



LOOKING DOWNSTREAM

C = 3.3 w/BOARDS C = 2.9 TOP OF DAM
C = 2.9 w/out

D-5

BRYANT ASSOCIATES, INC.
648 Beacon Street
BOSTON, MASSACHUSETTS 02215
(617) 247-1800

JOB NED-COE, UPPER PORTER POND DAM
SHEET NO. D- 6 OF
CALCULATED BY RG DATE
CHECKED BY SHS DATE
SCALE

BROCKTON LAKE DAM - H&H cont'd

STAGE DISCHARGE WITH FLASHBOARDS

(H=0 @ SPILLWAY CREST)

1) SPILLWAY : $C = 3.3$ $L = 25'$ $Q_s = CLH^{1.5}$

2) TOP OF DAM : $C = 2.9$ $L = 1800 - 25 = 1775$ $Q_{dam} = CL(H-3.3)^{1.5}$

ELEVATION MSL	H Ft.	Q_s CFS	Q_{top} CFS	ΣQ CFS
201	0	0	0	0
202	1	83	0	83
203	2	233	0	233
204	3	429	0	429
204.3	3.3	495	0	495
205	4	660	3,015	3,675
206	5	922	11,410	12,332
207	6	1,213	22,837	24,050
208	7	1,528	36,635	38,163
209	8	1,867	52,450	54,317
210	9	2,228	70,050	72,278

SPILLWAY DISCHARGE WITH NO FLASHBOARDS FOR TOP OF DAM EL.

$C = 2.8$ $L = 25$ $q = CL(H+2.5)^{1.5}$

$q = 978$ CFS

STORAGE

	ELEV. (MSL)	AREA (Ac.) (PLANIMETERED FROM USGS)	STORAGE (ACRE FEET) (COMPUTED BY HEC-1 PROGRAM)
	194.3	0	0
NORMAL POOL	201	85	190
TOP OF DAM	204.3	—	493
	210	126	1133

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(617) 247-1800

JOB NED-COE, UPPER PORTER POND DAM
SHEET NO. D-7 OF
CALCULATED BY RG DATE
CHECKED BY SHS DATE
SCALE

WALDO LAKE DAM - H&H

1/

SUBDRAINAGE AREA = 0.38 Sq Mi

SNYDER HYDROGRAPH COEFFICIENTS

$C_t = 2.0$ $C_p = 0.5$

Tp COMPUTATIONS

$L = 0.85$ MILE $L_{ca} = 0.28$

$T_p = C_t \cdot (L \times L_{ca})^{.3}$

$T_p = 2 \times (.85 \times .28)^{.3}$ $T_p \simeq$ 1.25 HOURS

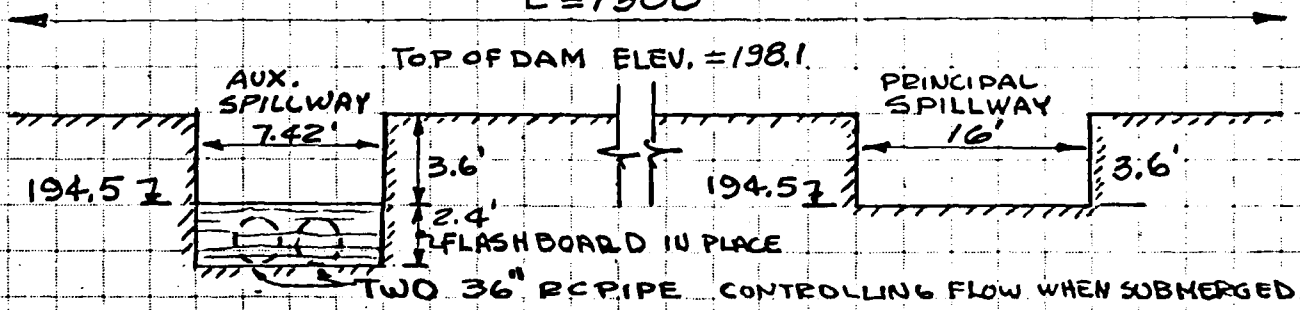
PMP DATA

FROM HMS #33 THE 24 HOUR 200 Sq Mi INDEX RAINFALL IS 21.5

6hr. %	OF	INDEX	FOR	THIS	BASIN	=	111
12hr "	"	"	"	"	"	=	124
24hr "	"	"	"	"	"	=	133

DAM ELEVATION & LENGTH and SPILLWAYS DIMENSIONS SKETCH

LOOKING DOWNSTREAM



C = 3.3 W/BOARDS C Top = 2.9 C = 3.1

LOOKING DOWNSTREAM

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JOB NED-COE, UPPER PORTER POND DAM
SHEET NO. D- 8 OF
CALCULATED BY RG DATE
CHECKED BY SHS DATE
SCALE

WALDO LAKE DAM H&H Cont'd

STAGE DISCHARGE

H=0 @ SPILLWAY CREST

1) SERVICE SPILLWAY : C = 3.1 L = 16' $Q_1 = CLH^{1.5}$
2) AUXILIARY SPILLWAY : C = 3.3 L = 7.42' $Q_2 = CLH^{1.5}$ FOR $H \leq 3.6$
3) H > 3.6 PIPE CONTROL $Q_3 = .65A\sqrt{2gd}$
4) TOP OF DAM : C = 2.9 L = 300' $Q_4 = CL(H-3.6)^{1.5}$

d = depth of water to centroid of pipe

ELEVATION MSL	H FT	Q_1	Q_2 CFS	Q_3	Q_4	ΣQ
194.5	0	0	0		0	
195.5	1	50	25		0	75
196.5	2	140	69.	PIPE	0	209
197.5	3	258	127.	FLOW	0	418
198.1	3.6	339	160		0	499
198.5	4	397	6	173	936	1,500
199.5	5	555	41.	188	6,132	6,916
200.5	6	729	91	202	13,764	14,786
201.5	7	919	154	215	23,209	24,497
202.5	8	1,122	226	227	34,168	35,743

OVERTOPPING

SURCHARGE STORAGE

		ELEVATION (MSL)	AREA (AC) (PLANIMETERED FROM USGS)	STORAGE (AC. FEET) (COMPUTED BY HEC-1 PROGRAM)
NORMAL POOL	(FROM)	194.5	77.	0
TOP OF DAM	(TO)	198.1	-	342
		200	137	581

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JOB NED-COE, UPPER PORTER POND DAM
SHEET NO D-9 OF
CALCULATED BY RG DATE
CHECKED BY SHS DATE
SCALE

LOWER PORTER DAM - H & H

1/

SUBDRAINAGE AREA = 0.08 Sq.Mi

SNYDER HYDROGRAPH COEFFICIENTS

$C_t = 2.0$ $C_p = 0.5$

T_p COMPUTATIONS

$L = 0.64$ MILES $L_{ca} = 0.23$ MILES

$T_p = C_t \cdot (L \times L_{ca})^{.3}$

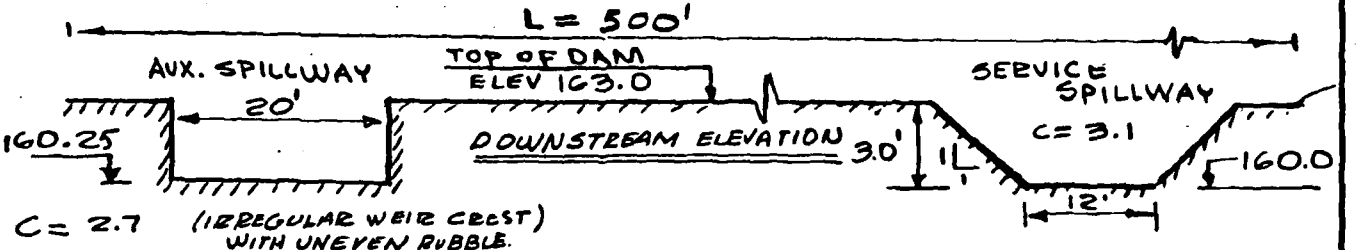
$T_p = 2 \times (.64 \times .23)^{.3} \simeq$ 1.13 HOURS

PMP DATA

FROM HMS #33 THE 24 HOUR 200 SqMi INDEX RAINFALL IS 21.5

6hr. % OF INDEX FOR THIS BASIN = 111
12hr. % " " " " " = 124
24hr. % " " " " " = 133

DAM ELEVATION & LENGTH and SPILLWAY DIMENSIONS SKETCH



C = 2.7 (IRREGULAR WEIR CREST) WITH UNEVEN RUBBLE.

C = 2.9 TOP OF DAM

LOOKING DOWNSTREAM

D-9

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JOB NED-COE, UPPER PORTER POND DAM
SHEET NO D-10 OF
CALCULATED BY RG DATE
CHECKED BY SHS DATE
SCALE

LOWER PORTER DAM cont'd

STAGE DISCHARGE

H = 0 @ SERVICE SPILLWAY CREST (ELEV. 160.0 MSL)

1) SERVICE SPILLWAY : $C = 3.1$ $L = 12'$ $Z = 1$
$b_o = 12'$ FOR $H \leq 3$ $Q_1 = C\left(\frac{b_o + b_H}{2}\right) H^{1.5}$
FOR $H > 3$ $Q_1 = C\left[\left(\frac{b_o + b_H}{2}\right) 3^{1.5} + 18 \times (H-3)^{1.5}\right]$

2) AUXILIARY SPILLWAY : $C = 2.7$ $L = 20'$ $Q_2 = CL(H-0.25)^{1.5}$

3) TOP OF DAM : $C = 2.9$ $L = 200 - 38 = 162'$ $Q_3 = CL(H-3)^{1.5}$

ELEVATION MSL	H Ft	Q_1 CFS	Q_2 CFS	Q_3 CFS	ΣQ CFS
160	0	0	0	0	0
161	1	40	35	0	75
162	2	123	125	0	248
163	3	242	246	0	488
164	4	297	392	1,339	2,028
165	5	399	559	3,790	4,748
166	6	532	745	6,962	8,239
167	7	688	947	10,718	12,353
168	8	865	1,165	14,979	17,009

STORAGE

	ELEVATION (Ft.)	AREA (ac.) (PLANIMETERED FROM USGS)	STORAGE (Ac. FEET) (COMP. BY HEC-1 PROGRAM)
	151	0	0
NORMAL POOL	160	8	24
TOP OF DAM	163	—	54
	170	24	177

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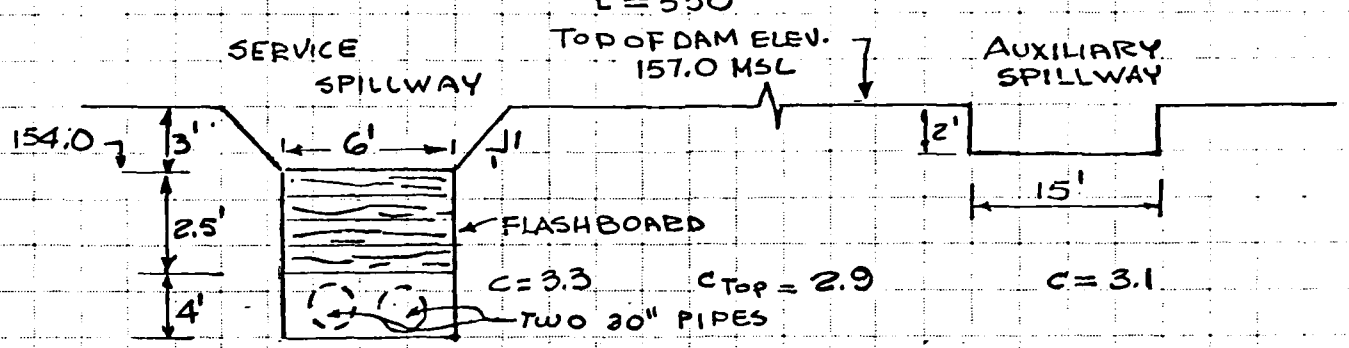
JOB NED-COE, UPPER PORTER POND DAM
SHEET NO. D-11 OF
CALCULATED BY RG DATE
CHECKED BY SHS DATE
SCALE

THIRTY ACRE POND

DAM ELEVATION & LENGTH and SPILLWAYS DIMENSIONS SKETCH



STAGE DISCHARGE

H = 0 @ SERVICE SPILLWAY CREST (ELEV. = 154.0 MSL)

1) SERVICE SPILLWAY FOR $H \leq 3$ $Q_1 = C\left(\frac{b_o + b_H}{2}\right) H^{1.5}$

FOR $H > 3$ $Q_1 = C\left[\left(\frac{b_o + b_H}{2}\right) 3^{1.5} + 12 \times (H-3)^{1.5}\right]$

2) AUXILIARY SPILLWAY $Q_3 = C\,L\,(H-1)^{1.5}$

3) TOP OF DAM: L = 523' $Q_4 = C\,L\,(H-3)^{1.5}$

ELEVATION MSL	H Ft.	Q_1	Q_2	Q_3	Q_4	EQ CFS
154	0	0		0	0	
155	1	23	PIPE FLOW	0	0	23
156	2	75		41	0	122
157	3	111	143	131	0	285
158	4	40	152	242	1517	1951
159	5	112	160	372	4290	4934
160	6	206	168	520	7881	8775

OVER TOPPING

SURCHARGE STORAGE

	ELEVATION	AREA (AC.) (PLANIMETERED FROM USGS)	STORAGE (AC. FEET) (COMPUTED BY HEC-1 PROGRAM)
NORMAL POOL	154	26	0
TOP OF DAM	157	—	86
	160	37	188

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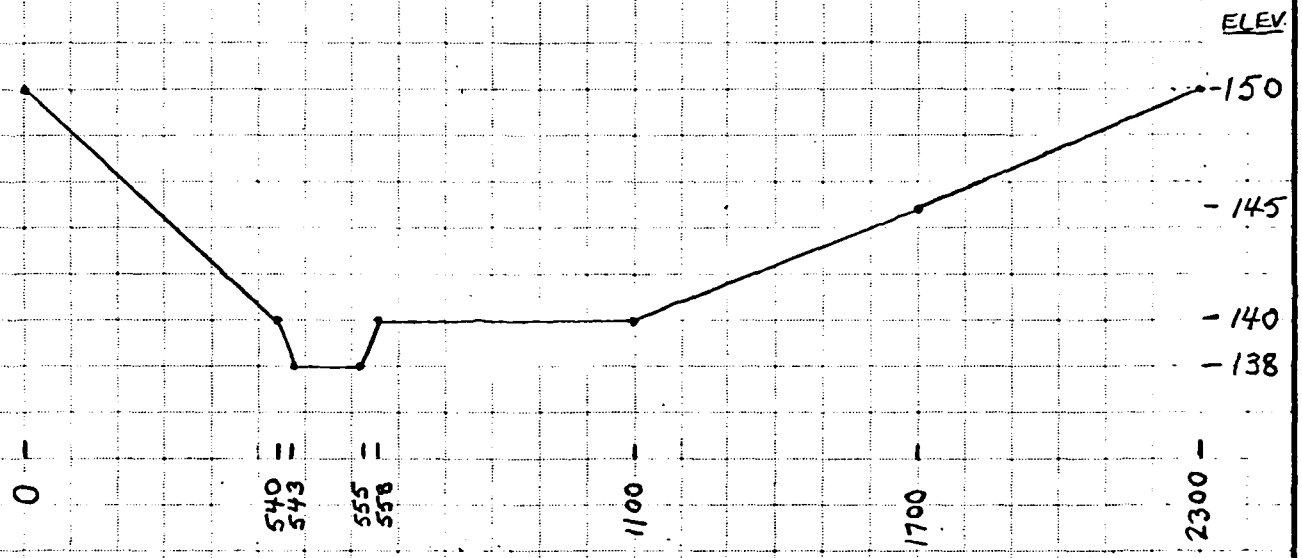
JOB NED-COE, UPPER PORTER POND DAM
SHEET NO D-12 OF
CALCULATED BY RG DATE
CHECKED BY SHS DATE
SCALE

BROCKTON

DOWNSTREAM ROUTING

SECTION @ HAZARD AREA

1200 FEET DOWNSTREAM OF THIRTYACRE POND DAM



MANNING'S COEFFICIENTS: CHANNEL → 0.03
OVERBANKS → 0.08

CHANNEL SLOPE: .008 FT./FT.

FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 FEB 79

FLOOD ROUTING THROUGH UPPER PORTER POND DAM WITHOUT BREACHING

INPUT

```
     1 A     HYDROLOGIC ANALYSIS OF UPPER PORTER POND DAM
     2 A          NATIONAL DAM SAFETY PROGRAM
     3 A          NEW ENGLAND DIVISION - CORPS OF ENGINEERS
     4 B   300    0      10     0      0      0      0      0      -4     0
     5 B1    5
     6 J     1    9      1
     7 J1   .1   .2     .3     .4     .5     .6     .7     .8     1.0
     8 K     0  BROCK                                   1
     9 K1     INFLOW TO BROCKTON LAKE
    10 M     1    1     2.8     0    3.37                                1
    11 P     0  21.5    111    124    133
    12 T                                                0     .05
    13 W   3.0   0.5
    14 X  -1.7  -0.1     2
    15 K     1  DAM 0                                   1
    16 K1     ROUTED OUTFLOW FROM BROCKTON LAKE DAM
    17 Y                          1      1
    18 Y1    1                                       -201.0    -1
    19 Y4  201   202    203    204   204.3   205     206    207    208    209
    20 Y4  210
    21 Y5    0    83     233    429    495   3675    12332  24050  38163  54317
    22 Y5 70278
    23 SA    0    85     126
    24 SE 194.3  201     210
    25 SS  201
    26 SD 204.3
    27 K     0  WALDO                                   1
    28 K1     INFLOW TO WALDO LAKE LESS BROCKTON
    29 M     1    1     0.38           3.37                                1
    30 P     0  21.5    111    124    133
    31 T                                                0.0   0.05
    32 W  1.25   0.5
    33 X  -1.7  -0.1     2
    34 K     2TOTAL                                    1
    35 K1     COMBINE HYDROGRAPHS
    36 K     1  WALDO                                   1
    37 K1     ROUTED OUTFLOW FROM WALDO LAKE
    38 Y                          1      1
    39 Y1    1                                       -194.5    -1
    40 Y4 194.5  195.5   196.5  197.5  198.1  198.5   199.5  200.5  201.5  202.5
    41 Y5    0    75     209    418    499   1500    6916   14786  24497  35743
    42 SA   77   137
    43 SE 194.5  200
    44 SS 194.5
    45 SD 198.1
    46 K     0  UPORT                                   1
    47 K1     INFLOW TO UPPER PORTER POND LESS WALDO LAKE
    48 M     1    1     0.11     0    3.37                                1
    49 P     0  21.5    111    124    133
    50 T                                                0.0   0.05
    51 W     1   0.5
    52 X  -1.7  -0.1     2
    53 K     2  TOTAL                                   1
    54 K1     COMBINE HYDROGRAPHS
    55 K     1  UPORT                                   1
    56 K1     ROUTED OUTFLOW FROM UPPER PORTER POND
    57 Y                          1      1
    58 Y1    1                                       -167.5    -1
    59 Y4 167.5  168.5   169.5  170.5   171    172     173    174    175    176
    60 Y5    0    78     219    403    508   1653    3584   6031   8900   12134
    61 SA    0    11      19
    62 SE  160  167.5     171
    63 SS 167.5
    64 SD  171
    65 K    99
```

FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 FEB 79

RUN DATE0 02/11/80.
TIME0 14.36.06.

HYDROLOGIC ANALYSIS OF UPPER PORTER POND DAM
NATIONAL DAM SAFETY PROGRAM
NEW ENGLAND DIVISION - CORPS OF ENGINEERS

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
300	0	10	0	0	0	0	0	-4	0

JOPER	NWT	LROPT	TRACE
5	0	0	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 9 LRTIO= 1

PERCENTAGES OF PMF USED → RTIOS= .10 .20 .30 .40 .50 .60 .70 .80 1.00

INFLOW HYDROGRAPH DEVELOPMENT FOR BROCKTON RESERVOIR

SUB-AREA RUNOFF COMPUTATION

INFLOW TO BROCKTON LAKE

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
BROCK	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	2.80	0.00	3.37	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	21.50	111.00	124.00	133.00	0.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	0.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA
TP= 3.00 CP= .50 NTA= 0

RECESSION DATA
STRTQ= -1.70 QRCSN= -.10 RTIOR= 2.00

UNIT HYDROGRAPH 100 END-OF-PERIOD ORDINATES, LAG= 2.99 HOURS, CP= .50 VOL= .98

4.	14.	30.	48.	69.	91.	115.	141.	167.	194.
220.	243.	263.	279.	293.	303.	310.	313.	309.	299.
287.	276.	265.	254.	244.	234.	224.	215.	207.	198.
190.	183.	175.	168.	162.	155.	149.	143.	137.	132.
126.	121.	116.	112.	107.	103.	99.	95.	91.	87.
84.	80.	77.	74.	71.	68.	65.	63.	60.	58.
55.	53.	51.	49.	47.	45.	43.	42.	40.	38.
37.	35.	34.	32.	31.	30.	29.	28.	26.	25.
24.	23.	22.	22.	21.	20.	19.	18.	18.	17.
16.	15.	15.	14.	14.	13.	13.	12.	12.	11.

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	22.88	21.68	1.20	230485.
										(581.)	(551.)	(30.)	(6526.6)

D-14

HYDROGRAPH ROUTING

ROUTED OUTFLOW FROM BROCKTON LAKE DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
DAM 0	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTOL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-201.	-1

STAGE	201.00 210.00	202.00	203.00	204.00	204.30	205.00	206.00	207.00	208.00	209.00
FLOW	0.00 70278.00	83.00	233.00	429.00	495.00	3675.00	12332.00	24050.00	38163.00	54317.00

STAGE-DISCHARGE DATA FOR BROCKTON RESERVOIR DAM

SURFACE AREA=	0.	85.	126.
CAPACITY=	0.	190.	1133.
ELEVATION=	194.	201.	210.

STAGE-STORAGE DATA FOR BROCKTON RESERVOIR DAM

SPILLWAY CREST ELEVATION →

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
201.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
TOP OF DAM ELEVATION → 204.3	0.0	0.0	0.

.1 PMF
PEAK OUTFLOW IS 208. AT TIME 23.00 HOURS

.2 PMF
PEAK OUTFLOW IS 478. AT TIME 22.33 HOURS

.3 PMF
PEAK OUTFLOW IS 1285. AT TIME 19.67 HOURS

.4 PMF
PEAK OUTFLOW IS 1826. AT TIME 19.00 HOURS

.5 PMF
PEAK OUTFLOW IS 2302. AT TIME 18.83 HOURS

ROUTED OUTFLOWS FROM BROCKTON RESERVOIR

.6 PMF
PEAK OUTFLOW IS 2765. AT TIME 18.83 HOURS

.7 PMF
PEAK OUTFLOW IS 3226. AT TIME 18.83 HOURS

.8 PMF
PEAK OUTFLOW IS 3694. AT TIME 18.83 HOURS

PMF
PEAK OUTFLOW IS 4619. AT TIME 18.67 HOURS

LOCAL RUNOFF TO WALDO LAKE

SUB-AREA RUNOFF COMPUTATION

INFLOW TO WALDO LAKE LESS BROCKTON

	ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
	WALDO	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	.38	0.00	3.37	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	21.50	111.00	124.00	133.00	0.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	0.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA

TP= 1.25 CP= .50 NTA= 0

RECESSION DATA

STRTQ= -1.70 QRCSN= -.10 RTIOR= 2.00

UNIT HYDROGRAPH 59 END-OF-PERIOD ORDINATES, LAG= 1.26 HOURS, CP= .50 VOL= 1.00

4.	16.	32.	50.	69.	85.	95.	99.	95.	86.
78.	71.	64.	58.	53.	48.	43.	39.	36.	32.
29.	27.	24.	22.	20.	18.	16.	15.	13.	12.
11.	10.	9.	8.	7.	7.	6.	6.	5.	5.
4.	4.	3.	3.	3.	3.	2.	2.	2.	2.
2.	1.	1.	1.	1.	1.	1.	1.	1.	

0 END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	22.88	21.68	1.20	31985.
										(581.)	(551.)	(30.)	(905.71)

COMBINE HYDROGRAPHS - COMBINING WALDO LAKE LOCAL RUNOFF AND BROCKTON RESERVOIR ROUTED OUTFLOW

COMBINE HYDROGRAPHS

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
TAL	2	0	0	0	0	1	0	0

****

HYDROGRAPH ROUTING

ROUTED OUTFLOW FROM WALDO LAKE

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
WALDO	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-195.	-1

STAGE-DISCHARGE DATA FOR WALDO LAKE DAM

STAGE	194.50	195.50	196.50	197.50	198.10	198.50	199.50	200.50	201.50	202.50
FLOW	0.00	75.00	209.00	418.00	499.00	1500.00	6916.00	14786.00	24497.00	35743.00

STAGE-STORAGE DATA FOR WALDO LAKE DAM

SURFACE AREA=	77.	137.
CAPACITY=	0.	581.
ELEVATION=	195.	200.

SPILLWAY CREST ELEVATION →

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
194.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
198.1	0.0	0.0	0.

TOP OF DAM ELEVATION →

ROUTED OUTFLOWS FROM WALDO LAKE

.1 PMF
PEAK OUTFLOW IS 142. AT TIME 29.67 HOURS

.2 PMF
PEAK OUTFLOW IS 351. AT TIME 27.67 HOURS

.3 PMF
PEAK OUTFLOW IS 804. AT TIME 22.33 HOURS

.4 PMF
PEAK OUTFLOW IS 1674. AT TIME 20.50 HOURS

.5 PMF
PEAK OUTFLOW IS 2445. AT TIME 19.50 HOURS

.6 PMF
PEAK OUTFLOW IS 3081. AT TIME 19.17 HOURS

.7 PMF
PEAK OUTFLOW IS 3644. AT TIME 19.00 HOURS

.8 PMF
PEAK OUTFLOW IS 4179. AT TIME 19.00 HOURS

PMF
PEAK OUTFLOW IS 5285. AT TIME 18.83 HOURS

LOCAL RUNOFF TO UPPER PORTER POND

SUB-AREA RUNOFF COMPUTATION

INFLOW TO UPPER PORTER POND LESS WALDO LAKE

	ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
	UPORT	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	.11	0.00	3.37	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	21.50	111.00	124.00	133.00	0.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	0.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA

TP= 1.00 CP= .50 NTA= 0

RECESSION DATA

STRTQ= -1.70 QRCSN= -.10 RTIOR= 2.00

UNIT HYDROGRAPH 46 END-OF-PERIOD ORDINATES, LAG= 1.00 HOURS, CP= .50 VOL= 1.00

2.	8.	16.	24.	31.	35.	35.	32.	28.	25.
22.	20.	17.	15.	13.	12.	10.	9.	8.	7.
6.	6.	5.	4.	4.	3.	3.	3.	2.	2.
2.	2.	1.	1.	1.	1.	1.	1.	1.	1.
1.	0.	0.	0.	0.	0.				

0 END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	22.88	21.68	1.20	9280.
										(581.)	(551.)	(30.)	(262.78)

COMBINE HYDROGRAPHS - COMBINING UPPER PORTER POND LOCAL RUNOFF AND WALDO LAKE ROUTED OUTFLOW

COMBINE HYDROGRAPHS

	ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
	TOTAL	2	0	0	0	0	1	0	0

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTED OUTFLOW FROM UPPER PORTER POND

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
UPORT	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-168.	-1

STAGE	167.50	168.50	169.50	170.50	171.00	172.00	173.00	174.00	175.00	176.00
FLOW	0.00	78.00	219.00	403.00	508.00	1653.00	3584.00	6031.00	8900.00	12134.00

STAGE-DISCHARGE DATA FOR UPPER PORTER POND DAM

SURFACE AREA=	0.	11.	19.
CAPACITY=	0.	28.	79.
ELEVATION=	160.	168.	171.

STAGE-STORAGE DATA FOR UPPER PORTER POND DAM

	CREL	SPWID	COOW	EXPW	ELEVL	COOL	CAREA	EXPL
SPILLWAY CREST ELEVATION →	167.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COOD	EXPD	DAMWID
TOP OF DAM ELEVATION → 171.0	0.0	0.0	0.

.1 PMF		
PEAK OUTFLOW IS	141. AT TIME	30.83 HOURS
.2 PMF		
PEAK OUTFLOW IS	347. AT TIME	28.83 HOURS
.3 PMF		
PEAK OUTFLOW IS	798. AT TIME	22.67 HOURS
.4 PMF		
PEAK OUTFLOW IS	1653. AT TIME	20.67 HOURS
.5 PMF		
PEAK OUTFLOW IS	2476. AT TIME	19.67 HOURS
.6 PMF		
PEAK OUTFLOW IS	3144. AT TIME	19.33 HOURS
.7 PMF		
PEAK OUTFLOW IS	3738. AT TIME	19.00 HOURS
.8 PMF		
PEAK OUTFLOW IS	4297. AT TIME	19.00 HOURS
PMF		
PEAK OUTFLOW IS	5441. AT TIME	18.83 HOURS

ROUTED OUTFLOWS FROM UPPER PORTER POND DAM

TEST FLOOD

D-19

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 .10	RATIO 2 .20	RATIO 3 .30	RATIO 4 .40	RATIO 5 .50	RATIO 6 .60	RATIO 7 .70	RATIO 8 .80	RATIO 9 1.00	
HYDROGRAPH AT	BROCK	2.80	1	465.	931.	1396.	1862.	2327.	2792.	3258.	3723.	4654.	BROCKTON INFLOW
		(7.25)		(13.18)	(26.36)	(39.54)	(52.71)	(65.89)	(79.07)	(92.25)	(105.43)	(131.79)	
ROUTED TO	DAM 0	2.80	1	208.	478.	1285.	1826.	2302.	2765.	3226.	3694.	4639.	BROCKTON OUTFLOW
		(7.25)		(5.89)	(13.53)	(36.38)	(51.70)	(65.18)	(78.31)	(91.36)	(104.61)	(131.37)	
HYDROGRAPH AT	WALDO	.38	1	102.	204.	307.	409.	511.	613.	715.	817.	1022.	WALDO LOCAL RUNOFF
		(.98)		(2.89)	(5.79)	(8.68)	(11.57)	(14.47)	(17.36)	(20.25)	(23.15)	(28.93)	
2 COMBINED	TAL	3.18	1	217.	502.	1418.	2073.	2631.	3164.	3691.	4218.	5334.	WALDO TOTAL INFLOW
		(8.24)		(6.14)	(14.21)	(40.14)	(58.69)	(74.51)	(89.59)	(104.53)	(119.44)	(151.03)	
ROUTED TO	WALDO	3.18	1	142.	351.	804.	1674.	2445.	3081.	3644.	4179.	5285.	WALDO OUTFLOW
		(8.24)		(4.01)	(9.93)	(22.77)	(47.39)	(69.24)	(87.24)	(103.18)	(118.32)	(149.66)	
HYDROGRAPH AT	UPORT	.11	1	33.	67.	100.	133.	166.	200.	233.	266.	333.	UPPER PORTER LOCAL RUNOFF
		(.28)		(.94)	(1.89)	(2.83)	(3.77)	(4.71)	(5.66)	(6.60)	(7.54)	(9.43)	
2 COMBINED	TOTAL	3.29	1	142.	351.	811.	1695.	2497.	3160.	3768.	4304.	5451.	UPPER PORTER TOTAL INFLOW
		(8.52)		(4.02)	(9.94)	(22.95)	(47.99)	(70.72)	(89.49)	(106.12)	(121.87)	(154.35)	
ROUTED TO	UPORT	3.29	1	141.	347.	798.	1653.	2476.	3144.	3738.	4297.	5441.	UPPER PORTER OUTFLOW
		(8.52)		(3.98)	(9.83)	(22.59)	(46.82)	(70.10)	(89.02)	(105.86)	(121.66)	(154.07)	

TEST FLOOD PEAK INFLOW

ROUTED TEST FLOOD OUTFLOW

FLOOD RESULTS AT BROCKTON RESERVOIR DAM

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	201.00	201.00	204.30
STORAGE	190.	190.	493.
OUTFLOW	0.	0.	495.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	202.83	0.00	353.	208.	0.00	23.00	0.00
.20	204.22	0.00	486.	478.	0.00	22.33	0.00
.30	204.47	.17	511.	1285.	5.50	19.67	0.00
.40	204.59	.29	523.	1826.	7.67	19.00	0.00
.50	204.70	.40	533.	2302.	9.33	18.83	0.00
.60	204.80	.50	543.	2765.	10.33	18.83	0.00
.70	204.90	.60	554.	3226.	11.33	18.83	0.00
.80	205.00	.70	564.	3694.	12.17	18.83	0.00
1.00	205.11	.81	575.	4639.	13.50	18.67	0.00

FLOOD RESULTS AT WALDO LAKE DAM

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	194.50	194.50	198.10
STORAGE	0.	0.	342.
OUTFLOW	0.	0.	499.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	196.00	0.00	126.	142.	0.00	29.67	0.00
.20	197.18	0.00	242.	351.	0.00	27.67	0.00
.30	198.22	.12	356.	804.	4.33	22.33	0.00
.40	198.53	.43	393.	1674.	7.50	20.50	0.00
.50	198.67	.57	410.	2445.	9.50	19.50	0.00
.60	198.79	.69	424.	3081.	10.67	19.17	0.00
.70	198.90	.80	437.	3644.	11.83	19.00	0.00
.80	198.99	.89	449.	4179.	12.67	19.00	0.00
1.00	199.20	1.10	475.	5285.	14.00	18.83	0.00

FLOOD RESULTS AT UPPER PORTER POND DAM

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	167.50	167.50	171.00
STORAGE	28.	28.	79.
OUTFLOW	0.	0.	508. → SPILLWAY DISCHARGE CAPACITY

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	168.94	0.00	46.	141.	0.00	30.83	0.00
.20	170.20	0.00	65.	367.	0.00	28.83	0.00
.30	171.25	.25	84.	798.	3.83	22.67	0.00
.40	172.00	1.00	100.	1653.	7.33	20.67	0.00
.50	172.43	1.43	109.	2476.	9.17	19.67	0.00
.60	172.77	1.77	117.	3144.	10.50	19.33	0.00
.70	173.06	2.06	124.	3738.	11.67	19.00	0.00
.80	173.29	2.29	130.	4297.	12.50	19.00	0.00
1.00	173.76	2.76	142.	5441.	14.00	18.83	0.00

→ TEST FLOOD ELEVATION

→ TEST FLOOD ROUTED OUTFLOW

UPPER PORTER POND DAM BREACH OUTFLOW
ROUTED THROUGH THE DOWNSTREAM RESERVOIRS
TO THE DAMAGE AREA

INPUT

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FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
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    1          A     HYDROLOGIC ANALYSIS OF UPPER PORTER POND DAM
    2          A          NATIONAL DAM SAFETY PROGRAM
    3          A     NEW ENGLAND DIVISION - CORPS OF ENGINEERS
    4          B   300       0      10       0       0       0       0       0      -4       0
    5          B1    5
    6          J     1       1       1
    7          J1    0
    8          K     1   UPORT                                                   1
    9          K1       ROUTED OUTFLOW FROM UPPER PORTER POND
   10          Y                                   1       1
   11          Y1    1                                                     -171      -1
   12          Y4  167.5   168.5   169.5   170.5     171     172     173     174     175     176
   13          Y5    0      78     219     403     508    1653    3584    6031    8900   12134
   14          SA    0      11      19
   15          SE  160    167.5   171
   16          SS 167.5
   17          SD  171
   18          SR  136    0.01    165       1   171.0     171
   19          K     1   LPORT                                                   1
   20          K1       UPPER PORTER BREACH THROUGH LOWER PORTER POND
   21          Y                                   1       1
   22          Y1    1                                                     -160      -1
   23          Y4  160     161     162     163     164     165     166     167     168
   24          Y5    0      75     248     488     202#    4748    8239   12353   17009
   25          SA    0       8      24
   26          SE  151     160     170
   27          SS  160
   28          SD  163
   29          K     1   TPOND                                                   1
   30          K1       UPPER PORTER BREACH THROUGH THIRTYACRE POND
   31          Y                                   1       1
   32          Y1    1                                                     -154      -1
   33          Y4  154     155     156     157     158     159     160
   34          Y5    0      23     122     285    1951    4934    8775
   35          SA   26      37
   36          SE  154     160
   37          SS  154
   38          SD  157
   39          K     1   HAZARD                                                  1
   40          K1       CHANNEL ROUTING TO HAZARD CENTER
   41          Y                                   1       1
   42          Y1    1                                                       -1
   43          Y6 0.08    0.03    0.08     138     150    1200   0.008
   44          Y7    0     150     540     140     543     138     555     138     558     140
   45          Y7 1100     140    1700     145    2300     150
   46          K    99
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**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
**********

RUN  DATE= 02/12/80.
     TIME= 10.41.00.

                    HYDROLOGIC ANALYSIS OF UPPER PORTER POND DAM
                          NATIONAL DAM SAFETY PROGRAM
                    NEW ENGLAND DIVISION - CORPS OF ENGINEERS

                                  JOB SPECIFICATION
          NO     NHR    NMIN    IDAY     IHR    IMIN   METRC    IPLT    IPRT   NSTAN
         300       0      10       0       0       0       0       0      -4       0
                                JOPER     NWT   LROPT   TRACE
                                    5       0       0       0

                          MULTI-PLAN ANALYSES TO BE PERFORMED
                              NPLAN= 1 NRTIO= 1 LRTIO= 1
NO INFLOW ---->  RTIOS=    0.00

**********  **********  **********  **********  **********

                                HYDROGRAPH ROUTING

                        ROUTED OUTFLOW FROM UPPER PORTER POND

                          ISTAO   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                          UPORT       1       0       0       0       0       1       0       0
                                        ROUTING DATA
                  QLOSS   CLOSS     AVG    IRES   ISAME   IOPT    IPMP            LSTR
                    0.0   0.000    0.00       1       1       0       0               0

                          NSTPS  NSTDL     LAG   AMSKK       X     TSK   STORA  ISPRAT
                              1       0       0   0.000   0.000   0.000   -171.      -1

STAGE     167.50    168.50    169.50    170.50    171.00    172.00    173.00    174.00    175.00    176.00
FLOW        0.00     78.00    219.00    403.00    508.00   1653.00   3584.00   6031.00   8900.00  12134.00

SURFACE AREA=     0.       11.       19.
    CAPACITY=     0.       28.       79.
   ELEVATION=   160.      168.      171.

                    CREL    SPWID    COQW    EXPW   ELEVL    COOL   CAREA    EXPL
SPILLWAY CREST ELEVATION --> 167.5      0.0     0.0     0.0     0.0     0.0     0.0     0.0

                                    DAM DATA
                                  TOPEL    COOD    EXPD   DAMWID
TOP OF DAM ELEVATION -->          171.0     0.0     0.0      0.

                                DAM BREACH DATA
                  BRWID       Z    ELBM   TFAIL    WSEL  FAILEL
                   136.     .01  165.00    1.00  171.00  171.00

BEGIN DAM FAILURE AT   0.00 HOURS

PEAK OUTFLOW IS      855. AT TIME    .58 HOURS
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STAGE-DISCHARGE DATA FOR UPPER PORTER POND DAM

STAGE-STORAGE DATA FOR UPPER PORTER POND DAM

BREACH DATA - FAILURE BEGINS IMMEDIATELY WITH RESERVOIR SURFACE AT TOP OF DAM

PEAK BREACH DISCHARGE

0-25

HYDROGRAPH ROUTING

UPPER PORTER BREACH THROUGH LOWER PORTER POND

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
LPORT	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTOL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-160.	-1

STAGE	160.00	161.00	162.00	163.00	164.00	165.00	166.00	167.00	168.00
FLOW	0.00	75.00	240.00	488.00	2028.00	4748.00	8239.00	12353.00	17009.00

} STAGE-DISCHARGE DATA FOR LOWER PORTER POND DAM

SURFACE AREA=	0.	8.	24.
CAPACITY=	0.	24.	177.
ELEVATION=	151.	160.	170.

} STAGE-STORAGE DATA FOR LOWER PORTER POND DAM

	CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
SPILLWAY CREST ELEVATION →	160.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

	TOPEL	COQD	EXPD	DAMWID
TOP OF DAM ELEVATION →	163.0	0.0	0.0	0.

PEAK OUTFLOW IS 752. AT TIME 1.00 HOURS

↳ ROUTED OUTFLOW AT LOWER PORTER POND DAM DUE TO BREACH OF UPPER PORTER POND DAM

HYDROGRAPH ROUTING

UPPER PORTER BREACH THROUGH THIRTYACRE POND

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
TPOND	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTOL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-154.	-1

STAGE	154.00	155.00	156.00	157.00	158.00	159.00	160.00
FLOW	0.00	23.00	122.00	285.00	1951.00	4934.00	8775.00

} STAGE-DISCHARGE DATA FOR THIRTYACRE POND DAM

SURFACE AREA=	28.	37.	
CAPACITY=	0.	188.	
ELEVATION=	154.	160.	

} STAGE-STORAGE DATA FOR THIRTYACRE POND DAM

	CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
SPILLWAY CREST ELEVATION →	154.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

	TOPEL	COQD	EXPD	DAMWID
TOP OF DAM ELEVATION →	157.0	0.0	0.0	0.

PEAK OUTFLOW IS 111. AT TIME 2.17 HOURS

→ ROUTED OUTFLOW AT THIRTYACRE POND DAM DUE TO BREACH OF UPPER PORTER POND DAM

HYDROGRAPH ROUTING

CHANNEL ROUTING TO HAZARD CENTER

ISTAU	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
HAZARD	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1.	0

NORMAL DEPTH CHANNEL ROUTING

SN(1)	SN(2)	SN(3)	ELNVT	ELMAX	RLNTH	SEL
.0800	.0300	.0800	138.0	150.0	1200.	.00800

} CHANNEL CHARACTERISTICS AT DOWNSTREAM DAMAGE AREA

→ CHANNEL INVERT ELEVATION

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC

0.00 150.00 540.00 140.00 543.00 138.00 555.00 138.00 558.00 140.00
1100.00 140.00 1700.00 145.00 2300.00 150.00

} CHANNEL CROSS-SECTION AT DOWNSTREAM DAMAGE AREA

STORAGE	0.00	.23	.48	.77	9.61	21.90	36.11	52.22	70.25	90.19
	112.05	135.81	161.49	189.08	218.58	249.99	283.32	318.56	355.70	394.77
OUTFLOW	0.00	25.09	80.84	161.54	1004.34	3526.43	7268.17	12147.89	18133.02	25212.25
	33385.64	42660.04	53046.66	64559.63	77215.15	91030.89	106025.57	122218.70	139630.39	158281.17
STAGE	138.00	138.63	139.26	139.89	140.53	141.16	141.79	142.42	143.05	143.68
	144.32	144.95	145.58	146.21	146.84	147.47	148.11	148.74	149.37	150.00
FLOW	0.00	25.09	80.84	161.54	1004.34	3526.43	7268.17	12147.89	18133.02	25212.25
	33385.64	42660.04	53046.66	64559.63	77215.15	91030.89	106025.57	122218.70	139630.39	158281.17

} STAGE → STORAGE AND STAGE - DISCHARGE DATA FOR THE DOWNSTREAM CHANNEL

MAXIMUM STAGE IS 139.5

→ STREAM ELEVATION AT DAMAGE CENTER

UPPER PORTER POND DAM
BREACH RESULTS

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	171.00	167.50	171.00
STORAGE	79.	28.	79.
OUTFLOW	508.	0.	508.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.00	170.95	0.00	79.	855.	0.00	.58	0.00

→ PEAK BREACH OUTFLOW

LOWER PORTER POND DAM

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	160.00	160.00	163.00
STORAGE	24.	24.	54.
OUTFLOW	0.	0.	488.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.00	163.18	.18	56.	762.	.33	1.00	0.00

THIRTYACRE POND DAM

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	154.00	154.00	157.00
STORAGE	0.	0.	86.
OUTFLOW	0.	0.	285.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.00	155.09	0.00	52.	111.	0.00	2.17	0.00

DAMAGE AREA → PLAN 1 STATION HAZARD

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
0.00	111.	139.5	2.33

→ STREAM ELEVATION AT DAMAGE AREA

→ STREAM FLOW AT DAMAGE AREA

APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

INVENTORY OF DAMS IN THE UNITED STATES

STATE	IDENTITY NUMBER	DIVISION	STATE	COUNTY	CONGR DIST.	STATE	COUNTY	CONGR DIST.	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE DAY | MO | YR
MA	025	NED	MA	023	11				UPPER PORTER POND	4206.1	7102.6	04JAN80

POPULAR NAME	NAME OF IMPOUNDMENT
	UPPER PORTER POND

REGION	BASIN	RIVER OR STREAM	NEAREST DOWNSTREAM CITY-TOWN-VILLAGE	DIST FROM DAM (MI.)	POPULATION
01	GA	BEAVER BROOK	BROCKTON	1	89000

TYPE OF DAM	YEAR COMPLETED	PURPOSES	STRUCTURAL HEIGHT (FT.)	HYDRAULIC HEIGHT (FT.)	IMPOUNDING CAPACITIES MAXIMUM (ACRE-FT.)	IMPOUNDING CAPACITIES NORMAL (ACRE-FT.)
MEPG	1940	R	11	11	79	28

DIST	OWN	FED R	PRV/FED	SCS A	VER/DATE
NED	N	N	N	N	

REMARKS

D/S HAS	SPILLWAY CREST LENGTH	SPILLWAY TYPE	SPILLWAY WIDTH (FT.)	MAXIMUM DISCHARGE (F.S.)	VOLUME OF DAM (CY)	POWER CAPACITY INSTALLED (MW)	POWER CAPACITY PROPOSED (MW)	NAVIGATION LOCKS NO	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)
2	340	U	25	508	7000											

OWNER	ENGINEERING BY	CONSTRUCTION BY
CITY OF BROCKTON MASS	UNKNOWN	UNKNOWN

REGULATORY AGENCY			
DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
NONE	NONE	MA DEQE	MA DEQE

INSPECTION BY	INSPECTION DATE DAY | MO | YR	AUTHORITY FOR INSPECTION
O'BRIEN & GERE ENGINEERS INC.	17OCT79	PL 92-367

REMARKS
TERRACED SPILLWAY

END

FILMED

6-85

DTIC